

**CLASS 277, SEAL FOR A JOINT OR JUNCTURE 49,****SECTION I - CLASS DEFINITION**

This is the generic class for a sealing means or a process of using a seal to act at a joint or juncture of adjacent parts to oppose passage of a fluid. The sealing means or process: (1) closes a space formed between or (2) deflects the fluid away from the joint or juncture by using the fluid, another fluid, or an article.

- (1) Note. For a seal that does not claim a static or dynamic use, it is permissible to use its disclosure for placement.

**SECTION II - LINES WITH OTHER CLASSES 52, AND WITHIN THIS CLASS**

In Class 520, Synthetic Resins or Natural Rubbers, subclasses 1+ are the generic subclasses for a synthetic resin or natural rubber preparation, and composition containing or treatment thereof is to be considered an integral part of Class 260 retaining all pertinent definitions and class lines, and having Classes 521, 522, 523, 524, 525, 526, 527, and 528 indented thereunder.

**SECTION III - REFERENCES TO OTHER 57, CLASSES****SEE OR SEARCH CLASS:**

- 29, Metal Working, for a method of mechanical manufacture, subclass 402.02 for a method of repairing a seal or element thereof not provided for elsewhere, subclasses 888.07+ for a method of piston ring or packing manufacture, or subclass 888.3 for a method of seal or packing manufacture; or for apparatus to assemble or disassemble, subclasses 700+ for general apparatus to assemble or disassemble, especially subclasses 222+ for an apparatus to insert or remove a piston ring, or subclass 236 for an apparatus to apply or remove a resilient well protector from a well sucker rod.
- 34, Drying and Gas or Vapor Contact With Solids, for apparatus to separate liquids from solids (i.e., drying) or contacting solids with gases or vapors, subclass 242 for means to seal an opening in a treating chamber against gas or vapor leakage, or subclass 601 that may have a seal between a rotating drum or receptacle, and a housing.

Movable or Removable Closures, for more than nominal movable or removable closure structure (e.g., door jam, etc.), subclasses 475.1+ for a seal acting at a juncture of the closure and an adjacent member, especially subclass 477.1 having an inflatable or fluid pressure responsive feature; subclass 478.1 having a magnetic feature, subclass 482.1 having a segmenting, replacing, adjusting, or severing feature; subclass 483.1 having complementary engaging portions on closure or closure and portal frame; subclass 489.1 anchored in channel or slot in closure or portal frame; subclass 490.1 having a U-shaped member or portion to mount the seal, or subclass 498.1 is tubular or has a tubular portion.

Static Structures (e.g., Buildings), for a site erected structure or related components (e.g., panels, beams, columns, etc.), subclasses 140+ for a burial vault having a separately placeable closure in abutting relation to wall edges and sealing material retaining construction, subclasses 393+ for a relatively yieldable preformed separator (i.e., expansion joint), or subclasses 408+ for a disparate sheet lamina between exposed surfaces of wall, floor, or roof (e.g., vapor barrier, waterproofing membrane, etc.).

Textiles: Spinning, Twisting, and Twining, for a process or apparatus for spinning, twisting, and twining.

73, Measuring and Testing, for a detailed structure or method for measuring or testing, subclasses 7+ for a measurement or test made involving anyone or any combination of operations of abrasion, milling, rubbing or scuffing; subclasses 46+ for testing or determining leakage between parts mechanically fitted together and capable of being separated without destruction; subclasses 700+ for direct measurement of fluid pressure; subclasses 863+ for obtaining a predetermined portion of a mass of material to be tested, or subclass 865.8 for apparatus or process for sensing and signaling, or for indicating a physical condition.

74, Machine Element or Mechanism, subclasses 18+ for a flexible sealing material attached to a casing and a moving rod, and a device or mechanism to move the rod.

87, Textiles: Braiding, Netting, or Lace Making, a process or apparatus for forming strands or fabrics from yarns, filaments or strands, by braiding, knotting, or intertwisting the strands, and the corresponding products or fabrics.

- 92, Expansible Chamber Devices, subclass 168 for a nonmetallic seal means between a piston or a part moved by the piston and a cylinder end portion; or subclasses 172+ for more than nominal detailed structure of a piston except where limited to detailed structure (e.g., seat, fluid passageway in seat, etc.) solely intended to cooperate with a piston ring or piston ring expander.
- 100, Presses, subclass 269.21 for a seal or gasket around a piston for a fluid activated reciprocating press.
- 114, Ships, for marine vehicles and accessories not otherwise classifiable, subclass 93 that may have a seal for a joint between a mast and a deck.
- 116, Signals and Indicators, for a specifically recited and detailed mechanical device for giving signals of the nature of an alarm or indicator that appeals to any one or more of the senses and combined with nominal apparatus structure from other classes, subclass 70 for a fluid-pressure variation alarm giving audible indication usually operated automatically; subclasses 101+ for a thermal alarm giving audible indication usually operated automatically; subclasses 109+ for a liquid level alarm giving audible indication usually operated automatically; subclass 112 for a fluid flow alarm giving audible indication usually operated automatically; subclass 208 for a wear indicator for an element having means to convey information to one of the senses; subclasses 216+ for a temperature responsive or compensating means indicator having means to convey information to one of the senses; subclasses 227+ for a liquid level indicator having means to convey information to one of the senses, or subclasses 266+ for a pressure indicator having means to convey information to one of the senses.
- 123, Internal-Combustion Engines, subclass 90.37 for a poppet valve mechanism's lubrication system's seal or shield that includes those mounted on a valve stem or subclass 188.6 for a seal in combination with a valve stem of an intake, exhaust or fuel valve of an internal combustion engine having a stationary opening (i.e., seat) and moving closure (i.e., head).
- 137, Fluid Handling, residual class for fluid material handling process or apparatus; subclasses 248+ for a liquid seal between relatively movable valving parts.
- 139, Textiles: Weaving, for manufacture of fabric by weaving threads.
- 148, Metal Treatment, subclass 238 for a process of nitriding using an externally supplied nitrogen source or subclasses 317+ for a stock product of the nitriding process.
- 156, Adhesive Bonding and Miscellaneous Chemical Manufacture, subclasses 60+ for a process of manufacturing an article involving surface bonding or assembly therefor or subclasses 349+ for an apparatus to manufacture an article involving surface bonding or assembly therefor.
- 165, Heat Exchange, subclasses 47+ for a heat exchanger including structural installation on apparatus external to the subject matter of this class.
- 166, Wells, for well apparatus having a seal where the well apparatus has a distinct feature (e.g.; above ground apparatus preventing upward or downward movement of an inner pipe, rod, or cable part depending into a well casing or tubing; above ground apparatus sealing the annular space between a broadly recited casing supported enclosure and an inner member; lateral port or valve on the tubular member above or below the packing; structural detail of the tubular member not contributing to the sealing function; etc.) other than sealing, subclasses 82.1+ for above ground apparatus having a releasable sealing or cleaning means for an inner part extending into the well; subclasses 84.1+ for above ground apparatus with a seal for a reciprocating part (e.g., sucker rod, etc.); subclasses 86.1+ for above ground apparatus having a valve combined with anchoring or sealing means between a casing and an inner part; subclasses 88.1+ for above ground apparatus having a lateral port combined with anchoring or sealing means between a casing and an inner part, or subclasses 179+ for a packer or plug insertable from the top of a well into a well conduit to seal between a longitudinally extending tubular part and the well conduit, especially subclass 87 for a seal expanded by confined fluid from central chamber, pump or plunger and subclass 202 for a cup type seal.
- 174, Electricity: Conductors and Insulators, for an insulator and specialized apparatus to mount, support, encase, box, or house an electrical component, subclass 23 for means using or adapted to use a fluid or vacuum including a seal, subclass 35 for an electromagnetic shield or anti-inductive device that may be a gasket,

- subclass 65 for a box or housing structurally limited to electrical use or including an electrical device, that may include a seal between a cable and the box or housing, or subclasses 152+ for a grommet to insulate a conductor as it extends through a wall or plate.
- 175, Boring or Penetrating the Earth, for processes and means for initially forming or radially enlarging an elongated hole in the earth in situ, subclasses 209+ for above ground means engaging bore entrance directing or receiving fluid or cuttings, subclass 214, for a seal located in a fluid head on a tool shaft, subclass 359 for mutually contacting cutter supports that are circumferentially displaced axes for a rolling cutter bit or rolling cutter bit element with seal details, or subclasses 371+ for a rolling cutter bit or rolling cutter bit element with seal details.
- 184, Lubrication, for a unitized lubrication means removable or installable from one machine to on another and intended to lubricate a bearing part in a machine, subclasses 24+ for a piston rod lubricator or subclasses 104.1+ for a lubricator including a heating or cooling device.
- 188, Brakes, for means of retarding motion of or stopping of machines; subclasses 72.4+ for a fluid pressure piston axially actuating a brake element or housing against a wheel that may include a seal, subclasses 73.44+ for an axially extending pin to retain an actuator axially slidable in a plane parallel to an axis of a rotating wheel that usually includes a seal, subclass 322.17 for an internal resistance motion retarder including a thrust component used to vary volume in a fluid-filled chamber having a particular retarder component structure with a dynamic sealing ring or flexible boot between a piston rod and cylinder, or subclass 322.18 for an internal resistance motion retarder including a thrust component used to vary volume in a fluid filled chamber having a particular retarder component structure with a dynamic sealing ring between a piston and cylinder.
- 205, Electrolysis: Processes, Compositions Used Therein, and Methods of Preparing the Compositions; for a process of making an electrolytic coating not provided for elsewhere, subclasses 178+ for multiple superposed coatings having at least one chromium-containing coating, or subclasses 283+ for a predominately chromium coating.
- 210, Liquid Purification or Separation, subclass 450 for a filter in a flow line or a flow line connected closed casing having a gasket between the filter and walls of the casing (e.g., oil filter gasket, etc.).
- 215, Bottles and Jars, for a cap-type bottle or jar closure, subclass 45 for neck structure to receive a particular closure including a seal, subclass 233 for a hardenable liquid or plastic seal where the closure seats on the bottle or jar; subclass 234 for a liquid seal located where the closure seats on the bottle or jar; or subclasses 341+ for a cap-type closure having an identifiable integral or separate seal or liner.
- 220, Receptacles, for a receptacle having an access opening and a removable closure for the opening and means to seal the juncture therebetween, subclass 228 for a liquid or semi-liquid gasket or subclass 378 for a gasket or packing.
- 222, Dispensing, subclass 542 for a seal provided for a joint, closure, or flow controller of a dispenser.
- 228, Metal Fusion Bonding; in general, for apparatus or method of joining the meeting faces of juxtaposed or engaged metal articles, of the same article originally in a form sustaining state, or a metal article to a nonmetal article, by direct application of heat or mechanical energy to the articles causing a flowing or blending of the meeting faces or causing a filler to flow or blend where the meeting faces to form a continuous interconnecting zone.
- 241, Solid Material Comminution or Disintegration, subclass 216 for cooperating comminuting surfaces having a gyratory member that includes rotary motion and means to seal the comminuting zone from a drive or other moving parts.
- 251, Valves and Valve Actuation, for means to close or restrict a flow of fluid through a passage by a definite predetermined motion of the means combined with a seal, subclasses 1.1+ for a plurality of relatively movable sealing members that control an annular passage between a well casing and a drill stem, axial rod or pipe; subclasses 171 for a gland member pressing a seal constituting a valve seat against a valve head; subclass 189 for separate actuators or different functions of the same actuator to increase contact pressure between piston type valves provided with expansible sealing and a seat; subclass 191 for means to increase the contact pressure between a piston-type valve having a seal that expands upon closing and a seat; subclass 214 for a valve actuated by a mechanical movement means and having a particularly associated sealing means for either;

- subclass 257 for a valve actuated by a cam encased in a valve body having a seal; subclasses 306+ for a rotary butterfly valve having a seal carried by the valve or a valve seat; subclasses 314+ for a rotary valve and a seat therefor or a seal between the rotary valve and the seat; subclass 318 for a reciprocating valve having a seal made of nonresilient material on a reciprocating head element or seat made of a resilient material; subclasses 335.1+ for a flexible wall seal between an actuator and valve; or subclass 363 for a removable valve seat having a seal between the valve seat and its supporting structure.
- 252, Compositions; subclasses 62.51+ for a composition useful for a magnetic purpose or a process for making the composition; subclass 72 for a composition that contains an agent for stopping or reducing a leak in a container; or subclass 378 for a process of intumescent vermiculite, other micaceous substances or other materials, or a product of such a process, not provided for elsewhere.
- 264, Plastic and Nonmetallic Article Shaping or Treating: Processes, subclasses 239+ for mechanical shaping or molding to form or reform a shaped article, especially subclasses 259+ for a composite article created by shaping or forming molding material against and uniting to a preform.
- 285, Pipe Joints or Couplings, for means to secure in end-to-end or side-to-side relationship a pipe to another pipe, a plate, a wall, a receptacle, or other base where the means are independent from a seal (i.e., more than the frictional engagement of the seal secures a pipe end to another part) or a sleeve securing the pipe ends or another part; subclasses 95+ for a seal responsive to line pressure or means to test the seal by using line pressure, especially subclass 97 for a seal having an inflatable member having an external pressure supply; subclass 187 for temperature responsive means to maintain a good seal for expansion or contraction in the pipe coupling; or subclasses 335+ for a seal combined with the pipe joint or coupling.
- 296, Land Vehicles: Bodies and Tops, for a body secured to the running gear and a top therefor, subclass 93 for weatherstripping to seal between panels or between a windshield and the body or top.
- 301, Land Vehicles: Wheels and Axles, for a wheel or axle, or where they are a dominant feature when combined with other vehicle structure; subclass 123 for a seal to exclude dirt or dust from a wheel or axle bearing.
- 305, Wheel Substitutes for Land Vehicles, subclasses 100+ for a flexible track joint structure (e.g., pin, link, etc.) including a seal, deflector, or scraper; or subclass 118 for a passageway in a connector pin to provide lubrication.
- 335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets; subclasses 209+ for a magnet or an electromagnet, configured or arranged to perform external mechanical work but does not include the external mechanical work.
- 366, Agitating, subclass 183.4 for a closed connection (e.g., sealed joint, etc.) between a static conveyor with gravity discharge and a rotating mixing chamber.
- 374, Thermal Measuring and Testing, subclasses 141+ for temperature sensing in combination with only a nominally recited diverse art device.
- 376, Induced Nuclear Reactions: Processes, Systems, and Elements, subclasses 203+ for a seal at a joint or juncture between and combined with fluid confining structures (e.g., a nozzle, a vessel cover, etc.) of a nuclear reactor pressure vessel.
- 384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclasses 130+ for a plain radial bearing having a specific seal, especially the following subclasses: subclass 131 where fluid moves the seal; subclasses 132+ where the seal is a barrier of liquid or gas; subclasses 135+ where centrifugal force moves or holds the seal in place; subclass 137 where the seal has means to remove excess lubricant from the shaft and return it to a lubricant reservoir or for removing material from the shaft about to enter the bearing from the outside; subclasses 139+ where the seal consists of a relatively rotatable radially extending sealing face member (e.g., face, mechanical, etc.); subclass 144 where the seal is a labyrinth seal; subclasses 145+ where the seal conforms to a bearing surface that has a shape of sphere to permit angular or lateral movement; subclasses 147+ where the seal is a peripheral radially sealing flexible projection extending axially of a center of a seal seat to contact the relatively moving element to be sealed; sub-

- class 149, where the seal is radially contained with an axially acting follower; subclass 150 where mechanical means (e.g., nut, separate resilient elements, etc.) moves the seal; or subclasses 151+ where the seal's material is resilient and on the outer area of the bearing or shaft; subclass 159 for a railway car journal bearing having a detailed seal; subclasses 477+ for a radial antifriction bearing having a specific seal, especially subclass 478 where centrifugal force loads the seal or a liquid or gas forms a sealing barrier; subclass 479 where the seal establishes a pressure or pressure responsive means loads the seal; subclass 480 where the seal is a labyrinth seal; subclasses 481+ where the seal is a relatively rotatable radially extending sealing face member (e.g., face, mechanical, etc.); subclass 483 where the seal is a radially contained seal with an axially acting follower; subclasses 484+ where the seal is a peripheral radially sealing flexible projection contacting a relatively rotating surface parallel to the axis of rotation; subclass 488 where the seal is a radially extending, annular flange approaching but not contacting a relatively rotating member to substantially but not completely close an annular opening; subclass 489 where the seal is a resilient O-ring seal; or subclass 607 for a thrust bearing having a seal.
- 403, Joints and Connections, for a joint or connection structure that goes beyond providing an environment for a seal; subclasses 50+ for a flexible diaphragm or bellows secured to each part; subclass 134 for a ball and socket having an external seal (i.e., remote from the bearing surface); subclasses 135+ for a ball and socket that may have a seal at the bearing interface; or subclass 288 for a seal distinct from the joint and unnecessary to the connection of parts.
- 405, Hydraulic and Earth Engineering, subclass 152 for method or apparatus to form an underground passageway (e.g., tunnel, etc.) lined by panels having a seal between adjacent panels.
- 411, Expanded, Threaded, Driven, Headed, Tool-deformed, or Locked-threaded Fastener, for a fastener suited for general use, subclasses 369+ for a headed threaded fastening means and nut having a washer and seal, or subclass 542 for a washer configured for a fastener having a seal.
- 413, Sheet Metal Container Making, for a process or apparatus for performing an attendant operation before final assembly of a lid to a receptacle, subclass 7 for a process of applying a sealant to an end joint between the lid and the receptacle; subclass 9 for a process of joining a preformed gasket or liner to the lid; subclasses 12+ for a process of fabricating a frangible end closure or assembling a frangible part to an end closure; subclasses 19+ for a process of applying liquid to form a gasket or liner on the lid; subclass 34 for apparatus to seam together the receptacle and lid using a roller die including means to apply a gasket or seal therebetween; subclasses 58+ for apparatus to form lid having means to apply seal or liner, or subclasses 67+ for apparatus to form lid having means to form frangible zone in lid.
- 415, Rotary Kinetic Fluid Motors or Pumps, for a means of guiding or confining (e.g., casing, distributing means, etc.) a working fluid (i.e., a liquid or gas that contacts or supports a rotary means that drives or is driven by the liquid or gas), subclass 109 for a rotating shaft having an abutment surface imparting motion in a sealing fluid inside a chamber; subclasses 110+ this may include a seal to separate a fluid path to an interior part of an assembly between relatively movable parts and the working fluid path; subclasses 170.1+ this may include a seal between the rotary means (e.g., runner, etc.) and a static part, or subclass 230 for a seal between a shaft or shaft sleeve, and a static part.
- 417, Pumps, for a general means to move a fluid from one place to another having an inlet and an outlet, subclass 423.11 for a rotary electric motor and rotary non expansible chamber pump having sealing means therebetween.
- 418, Rotary Expansible Chamber Devices, subclass 55.4 for a helical working member (e.g., scroll, etc.) having planetary or planetating movement including a seal or subclasses 104+ for a working member having relative rotation to a surface of a working chamber to expand and contract the volume of the working chamber with a movable, expansible, adjustable, or deformable seal.
- 420, Alloys or Metallic Compositions, for a generic class for alloys containing metal or metallic compositions that contain a continuous phase of metal, methods of making it not provided for elsewhere or "elemental" metal, per se.
- 425, Plastic Article Shaping or Earthenware Shaping or Treating: Apparatus; a generic class for apparatus not provided for elsewhere to mold a

- plastic, shape molten materials where no molding surface is employed, treating a product made by the apparatus of this class, randomly deposit and bond particulate material, or a combination of apparatus of this class with any diverse working or treating apparatus, Digest 47 for a seal ring.
- 428, Stock Material or Miscellaneous Articles, a residual class for a structurally defined stock material, nonstructural laminate, an article of manufacture or intermediate article of manufacture, not provided for elsewhere; subclasses 131+ for a structurally defined web or sheet (e.g., an overall dimension, etc.) including an aperture; subclasses 320.2+ comprising a single or plural web or sheet that contains components where at least one contains a liquid or has a constituent trapped inside preformed walls; subclasses 357+ containing or consisting of a strand, fiber, grain, cell, particle, or any substance in terms of a particular size or shape, a plurality or such arranged relative to one another, a particular interengagement of a plurality of such or a coating associated therewith; subclasses 367+ containing carbon as an element or compound, and consisting of or coating a rod, strand, filament or fiber; subclass 406 containing or consisting of particulate matter comprising glass having a particular size or shape and a coating; subclasses 411.1+ for a composition of layers adhered or cohered to each other; subclass 426 for layers adhered or cohered to each other where a layer contains glass that may be in fiber or mat form; subclasses 544+ for metallic; subclasses 615+ comprising different contiguous layers or portions, each having a matrix or continuous phase of free metal; or subclasses 616+ comprising different contiguous layers or portions, each having a matrix or continuous phase of free metal having the property of bending or lengthening in a circular fashion in response to an increase in temperature.
- 445, Electric Lamp or Space Discharge Component or Device Manufacturing, subclass 25 for a process of display or gas panel making including a seal not elsewhere classified.
- 432, Heating, subclass 115 for a rotary drum mounted for rotation about a horizontal or slightly inclined axis, the rotation of the rotary drum imparting a tumbling motion to material placed therein, forming a juncture against a stationary part with a flexible seal, cooler seal, or an air curtain-type flow controller therebetween to prevent escape of the rotary drum's atmosphere or subclass 244 for a heating device specialized to feed or discharge a work chamber including a seal at the chamber's wall for conveyor arm or shaft.
- 433, Dentistry, subclass 115 for a seal in a motorized handheld tool or handpiece.
- 439, Electrical Connectors, for a generic electrical connection between at least two conducting elements permitting relative motion or where the connection is a readily made or broken type, subclass 89 for a seal to a connector having inductive shielding or arc suppressing means including an elastomeric or nonmetallic conductive portion; subclasses 271+ for a sealing element or material for cooperation with the coupled connector (e.g., gasket, etc.); subclass 559 for a seal to a coupling part that extends into a panel opening; or subclass 927 for a conductive gasket.
- 440, Marine Propulsion, for a vessel and a device (e.g., propeller, impeller, etc.) other than a sail to move the vessel through water, subclass 112 for means to mount an engine within the vessel's hull and sealing means for a propeller shaft that pierces the hull.
- 451, Abrading, subclasses 28+ for a process of performing an abrading operation (i.e., where the sharp edges of mineral crystals form the cutting instrument) and a process of performing an ancillary operation not provided for elsewhere.
- 464, Rotary Shafts, Gudgeons, Housings, and Flexible Couplings for Rotary Shafts, subclass 131 for a drive coupling that accommodates misaligned or angularly related axes through a radially directed pin having a particular bearing cup surrounding the pin end and a flexible seal, subclass 133 for a drive coupling that accommodates misaligned or angularly related axes through a radially directed pin and a flexible seal or subclasses 173+ for a flexible boot for a joint to transmit rotary torque.
- 494, Imperforate Bowl: Centrifugal Separators, for an apparatus or process that breaks down or subdivides a mixture of fluent material into components by using a receptaclelike part having a wall to subject the material to centrifugal force, subclasses 38+ including a seal.
- 501, Compositions: Ceramic, subclasses 1+ for inorganic compositions other than Portland cement or cementitious material prepared from gypsum that are heat-treated by firing, calcining, sintering, or fusion of a part of the inorganic material during manufacturing or

- subsequent use to effect hardening or fusion followed by hardening when cooled and processes not provided for elsewhere, and especially subclasses 11+ for a glass composition or a composition intended to be heat-treated to form a glass.
- 505, Superconductor Technology: Apparatus, Material, Process, subclass 165 for a high temperature (tc greater than 30 k) system, device, or component utilizing suspension of superconducting particulate material in liquid (e.g., seal, pump, etc.).
- 520, Synthetic Resins or Natural Rubbers, subclasses 1+ are the generic subclasses for a synthetic resin or natural rubber preparation. See Lines With Other Classes and Within This Class, for the lines between Classes 520, 260, 521, 522, 523, 524, 525, 526, 527, and 528.
- 523, Synthetic Resins or Natural Rubbers, subclass 179 for a process of preparing a desired or intentional composition of at least one solid polymer or specified intermediate condensation product, or product thereof having utility as an ablative, or an intumescent coating composition is claimed or solely disclosed, or to processes or preparation thereof.

#### SECTION IV - GLOSSARY

##### FLUID(S)

A liquid, gas, or particulate matter (e.g., dust, etc.) suspended in a liquid or gas.

##### MEMBER(S)

These are component(s) that make up the seal.

##### PART(S)

These are component(s) (e.g., housing, casing, rod, shaft, etc.) of the joint or juncture.

##### SUBCLASSES

##### 300 PROCESS OF DYNAMIC SEALING:

This subclass is indented under the class definition. Sealing means comprising use of the sealing means to oppose the flow of fluid at the joint or juncture between relatively movable parts and having a relatively movable relationship to at least one of the parts.

- (1) Note. Relative movement between the parts need only occur at one time during the operation of the parts being sealed while maintaining sealing during movement, but such movement excludes assembly or disassembly such as the unscrewing of a packed, threaded pipe joint.

##### SEE OR SEARCH THIS CLASS, SUBCLASS:

- 312+, for a process of static sealing.  
345+, for a seal between relatively movable parts (i.e., a dynamic seal).

##### 301 Close proximity seal (e.g., contactless, fluent, etc.):

This subclass is indented under subclass 300. Process of dynamic sealing wherein the sealing means is free of relatively movable sealing contact against the relatively movable parts and capable of acting upon or causing sealed or sealing fluid to oppose the flow of fluid at the joint or juncture between the relatively movable parts.

- (1) Note. This and indented subclasses are for a sealing means not dependent upon the physical contact between a sealing member and a relatively movable part to affect sealing such as abrading or frictional contact that forms a positive seal at the point of contact.
- (2) Note. In a close proximity seal (e.g., contactless, fluent, etc.) a distance between a sealing member and a part or another sealing member is not dependent upon rotational speed between relatively movable parts whereas in a hydrodynamic relatively rotatable radially extending sealing face member (e.g., face, mechanical, etc.) the distance will change when the rotational speed from normal operation to slower or nonrotational speeds.

##### SEE OR SEARCH THIS CLASS, SUBCLASS:

- 409+, for a dynamic, close proximity seal (e.g., contactless, fluent, etc.).

- 904, for a seal formed by a viscous fluid usually contained by one or more physical, contacting-type seals.
- 302 Magnetic:**  
This subclass is indented under subclass 301. Close proximity seal wherein the sealing means uses a polar field to control the movement of fluent material.
- SEE OR SEARCH CLASS:  
252, Compositions, subclasses 62.51+ for a composition useful for a magnetic purpose or a process for making the composition, not provided for elsewhere.
- 303 Labyrinth:**  
This subclass is indented under subclass 301. Close proximity seal wherein the sealing means uses a succession of baffles that define a clearance between each other or an additional member to provide a series of throttling zones.
- 304 Formed by pressurized sealing fluid introduced to form barrier:**  
This subclass is indented under subclass 301. Close proximity seal wherein the joint or juncture has sealing fluid introduced into it at a pressure equal to or greater than the pressure of the sealed fluid to oppose the flow of the sealed fluid.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
926, for a seal for other than a process of dynamic close proximity seal (e.g., contactless, fluent, etc.) created by pressurized sealing fluid introduced to form a barrier having means to create a fluid pressure equilibrium at a joint or juncture.  
927, for a seal for other than a process of dynamic close proximity seal (e.g., contactless, fluent, etc.) created by pressurized sealing fluid introduced to form a barrier having means to create a fluid pressure different from the sealed fluid pressure.
- 305 Floating ring or bushing:**  
This subclass is indented under subclass 301. Close proximity seal wherein the seal is an annular or tubular seal forming a gap or clearance between the relatively movable parts and having relative movement between the relatively movable parts to oppose the flow of fluid.
- (1) Note. A floater-type seal has relative motion between the relatively movable parts it seals between, whereas a seal that accommodates gyratory or oscillatory motion is capable of sealing relatively movable parts that move angularly, axially, or perpendicularly to its main axis of motion.
- 306 Relatively rotatable radially extending sealing face member (e.g., face, mechanical, etc.):**  
This subclass is indented under subclass 300. Process of dynamic sealing including at least one of a pair of opposing surface members relatively rotating at the joint or juncture that defines a sealing face and wherein the joint or juncture is at an angle to a rotational axis formed between the relatively movable parts.
- (1) Note. In a hydrodynamic relatively rotatable radially extending sealing face member (e.g., face, mechanical, etc.) a distance between a sealing member and a part or another sealing member will change when the rotational speed between relatively movable parts goes from normal operation to slower or non-rotational speeds whereas in a close proximity seal (e.g., contactless, fluent, etc.) the distance is not dependent upon rotational speed.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
358+, for a relatively rotatable radially extending sealing face member (e.g., face, mechanical, etc.).
- 307 Formed by flexible projection:**  
This subclass is indented under subclass 306. Process of dynamic sealing wherein the sealing member is a pliant or resilient extension.
- 308 Contained or compressed by gland member in packing box:**  
This subclass is indented under subclass 300. Process of dynamic sealing wherein the seal is intended for use in a chamber having an axially



opened end to receive the seal and a member that substantially closes the open end to retain or squeeze the seal within the chamber while having an opening for passage for one of the relatively movable parts.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 329+, for a seal for well apparatus where the seal is in a packing box contained or compressed by a gland member.
- 510+, for a dynamic, circumferential contact seal for other than a piston intended to be contained or compressed by a gland member in a packing box.

**309 Peripheral radially sealing flexible projection (e.g., lip, piston cup seal, etc.):**

This subclass is indented under subclass 300. Process of dynamic sealing wherein the sealing means is a pliant or resilient extension having a tip for relatively movable contact to an inner or outer perimeter of one of the relatively movable parts.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 311, for a process of dynamic sealing employing a flexible ring.
- 436+, for a piston ring having a peripheral radially sealing flexible projection (e.g., piston cup, etc.).
- 549+, for a dynamic, circumferential contact seal for other than a piston having a peripheral, radially sealing, flexible projection (e.g., lip seal, etc.).

**310 Piston ring for internal combustion engine:**  
This subclass is indented under subclass 300. Process of dynamic sealing wherein the sealing means is an annulus for use on a part (i.e., a piston) that reciprocates along an axis of an enclosing wall of an internal combustion engine and the seal is for engaging the wall.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 311, for a process of dynamic sealing employing a flexible ring.
- 434+, for a piston ring or piston ring expander or seat therefor.

**311 Flexible ring:**

This subclass is indented under subclass 300. Process of dynamic sealing wherein the sealing means is a pliant or resilient annulus.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 309, for a process of dynamic sealing employing a peripheral, radially sealing, flexible projection (e.g., lip seal, piston cup, etc.).
- 310, for a process of dynamic sealing employing a piston ring for an internal combustion engine.
- 434+, for a piston ring or piston ring expander, or seat therefor.
- 500+, for a dynamic, circumferential contact seal for other than a piston.

**312 PROCESS OF STATIC SEALING:**

This subclass is indented under the class definition. Sealing means comprising use of the sealing means to oppose a flow of fluid at the joint or juncture between stationary or relatively movable parts and having a fixed relationship to the parts.

- (1) Note. Some relative movement is permissible due to such examples as expansion, contraction, slippage, or variable pressure load.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 300+, for a process of dynamic sealing.
- 590+, for a seal between fixed parts or having a fixed relationship against relatively movable parts.

**313 Between parts of internal combustion engine:**

This subclass is indented under subclass 312. Process of static sealing wherein the sealing means is for use at the joint or juncture between static parts of an internal combustion engine.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 591+, for a static contact seal intended for use between parts of an internal combustion engine.

**314 Pipe, conduit, or cable:**

This subclass is indented under subclass 312. Process of static sealing intended for use on an extended hollow or electrically insulated conductor part to seal the joint or juncture between concentric extended hollow or electrically insulated conductor parts; the extended hollow or electrically insulated part's end, and another extended hollow or electrically insulated conductor part's end; or the extended hollow part or electrically insulated conductor, and a wall.

SEE OR SEARCH THIS CLASS, SUBCLASS:

602+, for a static contact seal intended for use on a pipe, conduit, or cable.

**315 Using flexible sleeve, boot, or diaphragm:**

This subclass is indented under subclass 312. Process of static sealing wherein the sealing means has a flexible wall member to accommodate relatively movable parts allowing static contact sealing against the parts.

SEE OR SEARCH THIS CLASS, SUBCLASS:

389, for a relatively rotatable radially extending sealing face member (e.g., face, mechanical, etc.) including fluid pressure acting against a bellows or diaphragm to create an axial bias therefor.

391+, for a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.) including a flexible sleeve, boot, or diaphragm to provide a secondary seal or driving connection therefor.

504, for a dynamic, circumferential contact seal for other than a piston that accommodates gyratory or oscillatory motion by using a flexible connection having static contact between the seal and one of the relatively movable parts.

634+, for a static contact flexible sleeve, boot, or diaphragm seal for other than an internal combustion engine, or a pipe, conduit, or cable.

**316 Forming in place (i.e., in situ):**

This subclass is indented under subclass 312. Process of static sealing wherein the sealing means is a sealing material initially in a fluent or transient state introduced into the joint or juncture between the relatively static parts where it transforms into its final functional condition.

SEE OR SEARCH CLASS:

264, Plastic and Nonmetallic Article Shaping or Treating: Processes, subclasses 239+ for mechanical shaping or molding to form or reform a shaped article, especially subclasses 259+ for a composite article created by shaping or forming molding material against and uniting to a preform.

413, Sheet Metal Container Making, for a process or apparatus for performing an attendant operation before final assembly of a lid to a receptacle, subclass 7 for a process of applying a sealant to an end joint between the lid and the receptacle, subclass 9 for a process of joining a preformed gasket or liner to the lid, or subclasses 19+ for a process of applying liquid to form a gasket or liner on the lid,

**317 SEAL COMBINED WITH INDICATOR, SAMPLER OR INSPECTION FEATURE:**

This subclass is indented under the class definition. Sealing means combined with other means to display, test, or examine a condition or function of the sealing means or a chamber for the sealing means.

SEE OR SEARCH CLASS:

73, Measuring and Testing, for a detailed structure or method for measuring or testing, subclasses 863+ for obtaining a predetermined portion of a mass of material to be tested or subclass 865.8 for apparatus or process for sensing and signaling, or for indicating a physical condition.

**318 Fluid pressure:**

This subclass is indented under subclass 317. Indicator, sampler, or inspection feature wherein the condition or function is force per unit area exerted by a liquid or gas.

## SEE OR SEARCH CLASS:

- 73, Measuring and Testing, for a detailed structure or method for measuring or testing, subclasses 700+ for direct measurement of fluid pressure.
- 116, Signals and Indicators, for a specifically recited and detailed mechanical device for giving signals of the nature of an alarm or indicator that appeals to any one or more of the senses and combined with nominal apparatus structure from other classes, subclass 70 for a fluid-pressure variation alarm giving audible indication usually operated automatically, or subclasses 266+ for a pressure indicator having means to convey information to one of the senses.

**319 Fluid temperature:**

This subclass is indented under subclass 317. Indicator, sampler, or inspection feature wherein the condition or function is a measure of warmth or coldness of a liquid or gas using a reference to some standard value.

## SEE OR SEARCH CLASS:

- 116, Signals and Indicators, for a specifically recited and detailed mechanical device for giving signals of the nature of an alarm or indicator that appeals to any one or more of the senses and combined with nominal apparatus structure from other classes, subclasses 101+ for a thermal alarm giving audible indication usually operated automatically, or subclasses 216+ for a temperature responsive or compensating means indicator having means to convey information to one of the senses.
- 374, Thermal Measuring and Testing, subclasses 141+ for temperature sensing in combination with only a nominally recited diverse art device.

**320 Fluid leakage:**

This subclass is indented under subclass 317. Indicator, sampler, or inspection feature wherein the condition or function is escape or entry of fluid for the sealing means or chamber for the sealing means.

## SEE OR SEARCH CLASS:

- 73, Measuring and Testing, for a detailed structure or method for measuring or testing, subclasses 46+ for testing or determining leakage between parts mechanically fitted together and capable of being separated without destruction.
- 116, Signals and Indicators, for a specifically recited and detailed mechanical device for giving signals of the nature of an alarm or indicator that appeals to any one or more of the senses and combined with nominal apparatus structure from other classes, subclasses 109+ for a liquid level alarm giving audible indication usually operated automatically, subclass 112 for a fluid flow alarm giving audible indication usually operated automatically, or subclasses 227+ for a liquid level indicator having means to convey information to one of the senses.

**321 Wear, proper seating or presence:**

This subclass is indented under subclass 317. Indicator, sampler, or inspection feature wherein the means shows deterioration, proper or improper positioning, or location to aid in sealing to oppose the flow of fluid.

## SEE OR SEARCH CLASS:

- 73, Measuring and Testing, for a detailed structure or method for measuring or testing, subclasses 7+ for a measurement or test made involving any one or any combination of operations of abrasion, milling, rubbing, or scuffing.
- 116, Signals and Indicators, for a specifically recited and detailed mechanical device for giving signals of the nature of an alarm or indicator that appeals to any one or more of the senses and combined with nominal apparatus structure from other classes, subclass 208 for a wear indicator for an element having means to convey information to one of the senses.

**322 SEAL FOR WELL APPARATUS:**

This subclass is indented under the class definition. Sealing means wherein the sealing means is for use in a device or mechanism that extracts fluid from earth (e.g., a well, pump, etc.) or bores or penetrates the earth.

- (1) Note. Art terms such as packer, polish rod, stringer, tool, swab, shoe, etc., describe well or well-drilling apparatus.

**SEE OR SEARCH CLASS:**

- 166, Wells, for well apparatus having a seal where the well apparatus has a distinct feature (e.g.; above ground apparatus preventing upward or downward movement of an inner pipe, rod, or cable part depending into a well casing or tubing; above ground apparatus sealing the annular space between a broadly recited casing supported enclosure and an inner member; lateral port or valve on the tubular member above or below the packing; structural detail of the tubular member not contributing to the sealing function; etc.) other than sealing, subclasses 82.1+ for above ground apparatus having a releasable sealing or cleaning means for an inner part extending into the well, subclasses 84.1+ for above ground apparatus with a seal for a reciprocating part (e.g., sucker rod, etc.), subclasses 86.1+ for above ground apparatus having a valve combined with anchoring or sealing means between a casing and an inner part, subclasses 88.1+ for above ground apparatus having a lateral port combined with anchoring or sealing means between a casing and an inner part, or subclasses 179+ for a packer or plug insertable from the top of a well into a well conduit to seal between a longitudinally extending tubular part and the well conduit, especially subclass 87 for a seal expanded by confined fluid from central chamber, pump, or plunger, and subclass 202 for a cup-type seal.
- 175, Boring or Penetrating the Earth, for processes and means for initially

forming or radially enlarging an elongated hole in the earth, in situ, subclasses 209+ for above ground means engaging bore entrance directing or receiving fluid or cuttings, subclass 214 for a seal located in a fluid head on a tool shaft, subclass 359 for mutually contacting cutter supports that are circumferentially displaced axes for a rolling cutter bit or rolling cutter bit element with seal details, or subclasses 371+ for a rolling cutter bit or rolling cutter bit element with seal details.

**323 Installation, removal, assembly, disassembly, or repair feature:**

This subclass is indented under subclass 322. Seal for well apparatus including means to aid in mounting, extricating, construction, dismantling, or restoration of the seal.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 370+, for a relatively rotatable extending sealing face member (e.g., face, mechanical, etc.) having an installation, removal, assembly, disassembly, or repair feature.
- 421, for a close proximity labyrinth seal having an installation, removal, assembly, disassembly, or repair feature.
- 435, for a piston ring, piston ring expander or seat therefore having an installation, removal, assembly, disassembly, or repair feature.
- 511, for a dynamic, circumferential contact seal intended for containment or compression by a gland member in a packing box having an installation, removal, assembly, disassembly, or repair feature.
- 551, for a dynamic, peripheral, radially sealing, flexible projection (e.g., lip seal, etc.) for other than a piston having an installation, removal, assembly, disassembly, or repair feature.
- 598, for a static contact seal for use between parts of an internal combustion engine having an installation, removal, assembly, disassembly, or repair feature.

609, for a static contact seal intended for insertion between an end-to-end pipe, conduit, or cable joint having an installation, removal, assembly, disassembly, or repair feature.

630, for a static contact seal for other than an internal combustion engine, or a pipe, conduit, or cable having an installation, removal, assembly, disassembly, or repair feature.

**SEE OR SEARCH CLASS:**

29, Metal Working, for a method of mechanical manufacture or apparatus to assemble or disassemble, subclass 402.02 for a method of repairing a seal or element thereof not provided for elsewhere, or subclasses 700+ for general apparatus to assemble or disassemble, especially subclass 236 for an apparatus to apply or remove a resilient well protector from a well sucker rod.

**324 For overpressure control device (e.g., seal for a blowout preventer, etc.):**

This subclass is indented under subclass 322. Seal for well apparatus wherein the seal is for use in an annular passage formed between an inner part (e.g., cable, drill stem, pipe, rod, rope, string, tubing, etc.) and a surrounding part (e.g., well casing, tubing head, etc.) intended to regulate a higher than normal pressure condition or prevent upward movement of the inner part (e.g., cable, drill stem, pipe, rod, rope, string, tubing, etc.).

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

584, for a dynamic, circumferential contact seal for other than a piston having an extrusion preventing (i.e., anti-extrusion) structure.

611, for a static contact seal intended for insertion between an end-to-end pipe, conduit, or cable joint having an extrusion preventing (i.e., anti-extrusion) or compression limiting feature.

616+, for a static contact seal intended for use on a pipe, conduit, or cable having an associated mounting or retaining means for the seal.

638, for a static contact seal for other than an internal combustion engine, or a

pipe, conduit or cable including a particular extrusion preventing (i.e., anti-extrusion), mounting, or retaining means.

**SEE OR SEARCH CLASS:**

251, Valves and Valve Actuation, for means to close or restrict a flow of fluid through a passage by a definite predetermined motion of the means combined with a seal, subclasses 1.1+ for a plurality of relatively movable sealing members that control an annular passage between a well casing and a drill stem, axial rod, or pipe.

**325 Segmented radially actuated (e.g., ram type, etc.):**

This subclass is indented under subclass 324. Overpressure control device wherein the seal is divided into portions and intended for movement in a plane perpendicular to an annular axial flow path formed by the annular passage.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

344, for a segmented and radially actuated seal (e.g., oil saver, gas saver, etc.) for well apparatus.

543+, for a dynamic segmented ring circumferentially contacting seal for other than a piston.

626, for a static contact seal having a particular seal shape intended for use on a pipe, conduit or cable.

632, for a peripherally segmented static contact seal for other than an internal combustion engine, or a pipe, conduit, or cable.

**326 Rotatable:**

This subclass is indented under subclass 324. Overpressure control device wherein the seal is part of an assembly fixed to the inner part (e.g., cable, drill stem, pipe, rod, rope, string, tubing, etc.) that rotates relative to the surrounding part (e.g., well casing, tubing head, etc.).

**327 Axially compressed ring:**

This subclass is indented under subclass 324. Overpressure control device wherein the seal has an annular shape and is concentric to the annular passage including means acting along

an annular axial flow path formed by the annular passage axis to squeeze the seal.

SEE OR SEARCH THIS CLASS, SUBCLASS:

328+, for a seal for above ground well apparatus actuated along its longitudinal axis.

**328 Longitudinally actuated packer for above ground apparatus:**

This subclass is indented under subclass 322. Seal for well apparatus wherein the seal is between axially spaced members where one or more of the members axially bias the seal into sealing engagement at the joint or juncture between the part (e.g., axial rod, pipe, drill stem, etc.) surrounded by another part (e.g., well casing) intended to function or remain at ground level.

SEE OR SEARCH THIS CLASS, SUBCLASS:

327, for a sealing ring for well apparatus having an overpressure control device that works by axially compressing the seal.

**329 Contained or compressed by gland member in packing box:**

This subclass is indented under subclass 328. Longitudinally actuated packer wherein the seal is intended for use in a well apparatus having a chamber including an axially opened end to receive the seal and a member that substantially closes the open end to retain or squeeze the seal within the chamber while having an opening for passage for one of the parts.

SEE OR SEARCH THIS CLASS, SUBCLASS:

308, for a process of dynamic sealing employing a seal to be contained or compressed by a gland member in a packing box.

510+, for a dynamic, circumferential contact seal for other than a piston intended to be contained or compressed by a gland member in a packing box.

620+, for a static contact seal intended for use on a pipe, conduit, or cable including a clamping gland.

**330 For line or cable:**

This subclass is indented under subclass 329. Seal for well apparatus wherein the part (e.g., axial rod, pipe, drill stem, etc.) is a wire or cord.

**331 Inflatable packer:**

This subclass is indented under subclass 322. Seal for well apparatus including a member having a cavity or chamber therein or forms a cavity or chamber that includes one of the parts of the joint or juncture in the well apparatus for entry of a pressurized fluid to expand at least a portion of the sealing means into position against another part of the joint or juncture.

SEE OR SEARCH THIS CLASS, SUBCLASS:

336+, for a seal intended for use in below ground well apparatus.

605, for a hollow, fluid-filled, or inflatable static contact seal or an associated member intended for use on a pipe, conduit, or cable.

646, for a static contact seal having a hollow or fluid filled inflatable chamber for other than an internal combustion engine, or a pipe, conduit, or cable.

**332 Deforms radially inward:**

This subclass is indented under subclass 331. Inflatable packer for internal expansion against the part (e.g., rod, shaft, tubing, line, cable, etc.) extending through the inflatable packer.

SEE OR SEARCH THIS CLASS, SUBCLASS:

583, for a dynamic inflatable or biased by an inflatable member circumferential contact seal for other than a piston.

**333 And inflating medium control:**

This subclass is indented under subclass 331. Inflatable packer and a device or mechanism to regulate the pressurized fluid.

**334 Particular wall structure:**

This subclass is indented under subclass 331. Inflatable packer wherein the expanded portion of the sealing means or the sealing means biased by the expandable member has specific construction.

- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
 340+, for a longitudinally actuated packing sleeve for below ground well apparatus having a particular wall structure.
- 335 Axially facing packing cup:**  
 This subclass is indented under subclass 322. Seal for well apparatus wherein the seal has an open containerlike shape or form (e.g., C, U, V, etc.) radially extending to a longitudinal axis of one of the parts.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
 439, for a piston ring including a peripheral, radially sealing, flexible projection having a C, U, or V cross-sectional profile forming an axially facing cup (e.g., piston cup, etc.).  
 626, for a static contact seal having a particular seal shape intended for use on a pipe, conduit, or cable.
- 336 For below ground apparatus:**  
 This subclass is indented under subclass 322. Seal for well apparatus wherein the seal's use is on a device intended to function below earth level.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
 331+, for an inflatable packer-type seal for well apparatus.
- 337 Longitudinally actuated packer:**  
 This subclass is indented under subclass 336. Below ground apparatus wherein the seal's intended use is between axially spaced members and biased into sealing engagement by axial movement of at least one of the members.
- 338 Packing sleeve:**  
 This subclass is indented under subclass 337. Longitudinally actuated packer wherein the seal has an elongated tubular form.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
 585, for a dynamic, circumferential contacting, elongated sleeve or bushing for other than a piston.
- 607, for a sleeve-type, static contact seal intended for a pipe, conduit, or cable.
- 339 Expanded by wedging member:**  
 This subclass is indented under subclass 338. Packing sleeve includes a member having an inclined surface to radially bias the packing sleeve.
- 340 Particular wall structure:**  
 This subclass is indented under subclass 338. Packing sleeve wherein the packing sleeve has specific construction.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
 334, for an inflatable packer for well apparatus having a particular wall structure.
- 341 Reinforcing feature:**  
 This subclass is indented under subclass 340. Particular wall structure wherein the wall structure includes means to strengthen the wall.
- 342 Plural stacked rings:**  
 This subclass is indented under subclass 337. Longitudinally actuated packer comprising annular seals arranged axially in series.
- 343 Seal (e.g., wiper, oil saver, stripper, etc.) accommodates irregular size of inner part:**  
 This subclass is indented under subclass 322. Seal for well apparatus wherein the seal surrounds and adjusts to an inside part (e.g., tubing, string, rod, etc.) having varying proportions and intended to clean by rubbing or pushing off adherent foreign matter.
- 344 Segmented radially actuated packer (e.g., oil saver, gas saver, etc.) for above ground apparatus:**  
 This subclass is indented under subclass 322. Seal for well apparatus wherein the seal is divided into portions intended for movement in a direction perpendicular to and seal an annular axial flow path formed at the joint or juncture between the part (e.g., axial rod, pipe, drill stem, etc.) surrounded by another part (e.g., well casing) intended to function or remain at ground level.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 325, for a segmented and radially actuated (e.g., ram-type, etc.) seal for a well apparatus overpressure control device (e.g., seal for a blowout preventer, etc.).
- 543+, for a dynamic, segmented ring circumferentially contacting seal for other than a piston.
- 626, for a static contact seal having a particular seal shape intended for use on a pipe, conduit, or cable.
- 632, for a peripherally segmented static contact seal for other than an internal combustion engine, or a pipe, conduit, or cable.

**345 SEAL BETWEEN RELATIVELY MOVABLE PARTS (I.E., DYNAMIC SEAL):**

This subclass is indented under the class definition. Sealing means comprising sealing means to oppose the flow of fluid at the joint or juncture between relatively movable parts and having a relatively movable relationship to at least one of the parts.

- (1) Note. Relative movement between the parts need only occur at one time during the operation of the parts being sealed while maintaining sealing during movement, but such movement excludes assembly or disassembly such as the unscrewing of a packed threaded pipe joint.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 300+, for a process of dynamic sealing.
- 590+, for a seal between fixed parts or having a fixed relationship against relatively movable parts.
- 906, for a seal for a part having indefinite length (e.g., strip, sheet, etc.).

SEE OR SEARCH CLASS:

- 222, Dispensing, subclass 542 for a seal provided for a joint, closure or flow controller of a dispenser.
- 366, Agitating, subclass 183.4 for a closed connection (e.g., sealed joint, etc.) between a static conveyor with grav-

ity discharge and a rotating mixing chamber.

- 415, Rotary Kinetic Fluid Motors or Pumps, for a means of guiding or confining (e.g., casing, distributing means, etc.) a working fluid (i.e., a liquid or gas that contacts or supports a rotary means that drives or is driven by the liquid or gas), subclass 109 for a rotating shaft having an abutment surface imparting motion in a sealing fluid inside a chamber, subclasses 110+ for a seal to separate a fluid path to an interior part of an assembly between relatively movable parts and the working fluid path, subclasses 170.1+ for a seal between the rotary means (e.g., runner, etc.) and a static part, or subclass 230 for a seal between a shaft or shaft sleeve and a static part.
- 494, Imperforate Bowl: Centrifugal Separators, for an apparatus or process that breaks down or subdivides a mixture of fluent material into components by using a receptaclelike part having a wall to subject the material to centrifugal force, subclasses 38+ including a seal.

**346 Diverse and distinct dynamic seals:**

This subclass is indented under subclass 345. Dynamic seal includes disparate seal types distinguishable from each other and are for location on associated parts of the joint or juncture to constitute a sealing assembly.

- (1) Note. The components forming the sealing assembly may not be part of a single (e.g., removable, etc.) unit.
- (2) Note. Seals consisting exclusively of the same type (e.g., lip, mechanical, labyrinth, impeller, etc.) are not proper for this or indented subclasses.
- (3) Note. A translatable seal (e.g., floater, etc.) that carries thereon another diverse seal is not distinct.
- (4) Note. Cross diverse and distinct dynamic seals into subclasses for the seal types.



**347 Close proximity seal (e.g., contactless, fluent, etc.):**

This subclass is indented under subclass 346. Diverse and distinct dynamic seals wherein the sealing means is free of relatively movable parts and capable of acting upon or causing a sealed or sealing fluid to oppose the flow of fluid at the joint or juncture.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 301+, for a process of dynamic close proximity sealing (e.g., contactless, fluent, etc.).
- 409+, for a dynamic close proximity seal (e.g., contactless, fluent, etc.).
- 904, for a seal formed by a viscous fluid usually contained by one or more physical contacting type seals.

**348 And relatively rotatable radially extending contacting sealing members (e.g., face, mechanical, etc.):**

This subclass is indented under subclass 347. Close proximity seal and at least one of a pair of opposing surface members relatively rotating at the joint or juncture that defines a sealing face and wherein the joint or juncture is at an angle to a rotational axis formed between the relatively movable parts.

- (1) Note. A hydrodynamic, relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.) will only have a gap during normal rotational operation and will close its gap under slower or nonrotational speeds whereas a close proximity seal (e.g., contactless, , etc.) of the impeller type always has a gap between a fluent impeller and a part or another sealing member.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 306+, for a process of using a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.).
- 352+, for diverse and distinct dynamic seals having a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.) and other than

a close proximity seal (e.g., contactless, fluent, etc.).

- 358+, for a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.).

**349 And circumferential peripheral radially sealing flexible projection (e.g., lip seal, etc.):**

This subclass is indented under subclass 348. Face or mechanical seal and a pliant or resilient extension having a tip for relatively movable contact to an inner or outer perimeter of one of the parts.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 309, for a process of dynamic sealing employing a peripheral, radially sealing, flexible projection (e.g., lip seal, piston cup, etc.).
- 549+, for a dynamic, circumferential contact seal for other than a piston having a peripheral, radially sealing, flexible projection (e.g., lip seal, etc.).

**350 And circumferential contact seal:**

This subclass is indented under subclass 347. Close proximity seal and the seal having radial, peripheral, surface contact against one or more of the relatively movable parts.

**351 Peripheral radially sealing flexible projection (e.g., lip seal, etc.):**

This subclass is indented under subclass 350. Circumferential contact seal wherein the seal is a pliant or resilient extension having a tip for relatively movable contact to an inner or outer perimeter of one of the parts.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 309, for a process of dynamic sealing employing a peripheral, radially sealing, flexible projection (e.g., lip seal, piston cup, etc.).
- 549+, for a dynamic, circumferential contact seal for other than a piston having a peripheral, radially sealing, flexible projection (e.g., lip seal, etc.).

**352 Relatively rotatable radially extending contacting sealing members (e.g., face, mechanical, etc.):**

This subclass is indented under subclass 346. Diverse and distinct dynamic seals including at least one of a pair of opposing surface members relatively rotating at the joint or juncture that defines a sealing face and wherein the joint or juncture is at an angle to a rotational axis formed between the relatively movable parts.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

306+, for a process of using a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.).

348+, for diverse and distinct dynamic seals including a close proximity seal (e.g., contactless, fluent, etc.) and a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.).

358+, for a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.).

**353 And circumferential peripheral radially sealing flexible projection (e.g., lip seal, etc.):**

This subclass is indented under subclass 352. Diverse and distinct dynamic seals and a pliant or resilient extension having a tip for relatively movable contact to an inner or outer perimeter of one of the parts.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

309, for a process of dynamic sealing employing a peripheral radially sealing flexible projection (e.g., lip seal, piston cup, etc.).

549+, for a dynamic circumferential contact seal for other than a piston having a peripheral radially sealing flexible projection (e.g., lip seal, etc.).

**354 Helically threaded part:**

This subclass is indented under subclass 345. Dynamic seal wherein at least one of the parts has an indent or projection wound twistlike about its surface and has relative movement to the seal.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

911+, for a seal and nominal motion transmitting means.

**355 Brush seal:**

This subclass is indented under subclass 345. Dynamic seal wherein the sealing means is a plurality of bristles located at the joint or juncture on one of the parts and projecting towards the other.

**356 For journal box (e.g., railway car journal, etc.):**

This subclass is indented under subclass 345. Dynamic seal wherein the sealing means is for a box that encloses part of a machine shaft or axle supported by a bearing.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

543+, for a dynamic, segmented ring, circumferentially contacting seal for other than a piston.

579+, for a dynamic, circumferential contact, floating ring or bushing seal for other than a piston.

SEE OR SEARCH CLASS:

384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclass 159 for a railway car journal bearing having a detailed seal.

**357 For rotary piston:**

This subclass is indented under subclass 345. Dynamic seal wherein the sealing means is for an apparatus having a working chamber formed between relatively rotatable parts to aid in sealing to oppose the flow of fluid.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

398, for a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.) that accommodates or exhibits eccentric, gyratory, or oscillatory motion.

## SEE OR SEARCH CLASS:

- 418, Rotary Expansible Chamber Devices, subclasses 104+ for a working member having relative rotation to a surface of a working chamber to expand and contract the volume of the working chamber with a movable, expansible, adjustable, or deformable seal.

**358 Relatively rotatable radially extending sealing face member (e.g., face, mechanical, etc.):**

This subclass is indented under subclass 345. Dynamic seal including at least one of a pair of opposing surface members relatively rotating at the joint or juncture that defines a sealing face and wherein the joint or juncture is at an angle to a rotational axis formed between the relatively movable parts.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

- 306+, for a process of using a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.).
- 348+, for diverse and distinct dynamic seals including a close proximity seal (e.g., contactless, fluent, etc.) and a relatively rotatable radially extending sealing face member (e.g., face, mechanical, etc.).
- 352+, for diverse and distinct dynamic seals having a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.) and other than a close proximity seal (e.g., contactless, fluent, etc.).

## SEE OR SEARCH CLASS:

- 175, Boring or Penetrating The Earth, for processes and means for initially forming or radially enlarging an elongated hole in the earth in situ, subclass 359 for mutually contacting cutter supports that are circumferentially displaced axes for a rolling cutter bit or rolling cutter bit element with seal details or subclass 371 for a rolling cutter bit or rolling cutter bit element with seal details.

- 305, Wheel Substitutes for Land Vehicles, subclasses 100+ for a flexible track joint structure (e.g., pin, link, etc.) including a seal, deflector, or scraper.
- 384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclasses 139+ for a plain, radial bearing or subclasses 481+ for a radial, antifriction bearing where the seal is a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.).
- 417, Pumps, for a general means to move a fluid from one place to another having an inlet and an outlet, subclass 423.11 for a rotary, electric motor and rotary, nonexpansible chamber pump having sealing means therebetween.

**359 Temperature responsive feature:**

This subclass is indented under subclass 358. Sealing face member including means to react to a change in temperature.

- (1) Note. This and indented subclasses do not include a seal that merely accommodates thermal expansion between parts.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

- 931+, for a seal for other than a relatively rotatable, radially extending, sealing face member including a temperature responsive feature having a temperature responsive feature.

**360 Accommodates or prevents thermal distortion:**

This subclass is indented under subclass 359. Temperature responsive feature for adjusting to or deterring deformation caused by the change in temperature.

**361 Multiple sealing faces (e.g., double seals, etc.):**

This subclass is indented under subclass 358. Sealing face member including more than one pair of sealing faces.

- (1) Note. Sealing face members having one or more points of contact between them form only one sealing face.

## SEE OR SEARCH CLASS:

- 384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclass 143 for a plain, radial bearing having plural seals consisting of a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.).
- 362 Floating intermediate sealing face member:**  
This subclass is indented under subclass 361. Multiple sealing faces including a sealing face member located between and free (i.e., not fixed to one of the relatively movable parts) for rotating relatively to the relatively rotatable sealing face members fixed to their relatively movable parts.
- 363 Including an outwardly axial biasing member:**  
This subclass is indented under subclass 362. Floating intermediate sealing face member including means to force the floating intermediate sealing face member's sealing faces away from each other along a rotational axis formed between the relatively movable parts.
- 364 Concentric and radially spaced:**  
This subclass is indented under subclass 361. Multiple sealing faces including more than one pair of sealing face members having a common rotational axis formed between the relatively movable parts and having radially spaced, sealing face, contacting surfaces.
- 365 Three or more:**  
This subclass is indented under subclass 361. Multiple sealing faces having three or more sealing face surfaces.
- 366 Shaft mounted sealing face members biased axially away from each other:**  
This subclass is indented under subclass 361. Multiple sealing faces wherein the surface members are on the one relatively movable part (e.g., shaft, etc.) enclosed by the other relatively movable part (e.g., housing, casing, etc.) and forced along the rotational axis formed between the relatively movable parts in an outwardly direction.
- 367 Shaft mounted sealing face members biased axially towards each other:**  
This subclass is indented under subclass 361. Multiple sealing faces wherein the surface members are on the one relatively movable part (e.g., shaft, etc.) enclosed by the other relatively movable part (e.g., housing, casing, etc.) and forced along the rotational axis formed between the relatively movable parts in an inwardly direction.
- 368 Housing mounted sealing face members biased axially away from each other:**  
This subclass is indented under subclass 361. Multiple sealing faces wherein the surface members are on the one relatively movable part (e.g., housing, casing, etc.) that encloses the other relatively movable part (e.g., shaft, etc.) and forced along the rotational axis formed between the relatively movable parts in an outwardly direction.
- 369 Housing mounted sealing face members biased axially towards each other:**  
This subclass is indented under subclass 361. Multiple sealing faces wherein the surface members are on the one relatively movable part (e.g., housing, casing, etc.) that encloses the other relatively movable part (e.g., shaft, etc.) and forced along the rotational axis formed between the relatively movable parts in an inwardly direction.
- 370 Installation, removal, assembly, disassembly or repair feature:**  
This subclass is indented under subclass 358. Sealing face member including means to aid in mounting, extricating, construction, dismantling, or restoration of the seal.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 323, for a seal for well apparatus having an installation, removal, assembly, disassembly, or repair feature.
- 421, for a close proximity labyrinth seal having an installation, removal, assembly, disassembly, or repair feature.
- 435, for a piston ring, piston ring expander, or seat therefor having an installation, removal, assembly, disassembly, or repair feature.

- 511, for a dynamic, circumferential contact seal intended for containment or compression by a gland member in a packing box having an installation, removal, assembly, disassembly, or repair feature.
- 551, for a dynamic, peripheral, radially sealing, flexible projection (e.g., lip seal, etc.) for other than a piston having an installation, removal, assembly, disassembly, or repair feature.
- 598, for a static contact seal for use between parts of an internal combustion engine having an installation, removal, assembly, disassembly, or repair feature.
- 609, for a static contact seal intended for insertion between an end-to-end pipe, conduit, or cable joint having an installation, removal, assembly, disassembly, or repair feature.
- 630, for a static contact seal for other than an internal combustion engine, or a pipe, conduit, or cable having an installation, removal, assembly, disassembly, or repair feature.
- SEE OR SEARCH CLASS:
- 29, Metal Working, for a method of mechanical manufacture or apparatus to assemble or disassemble, subclass 402.02 for a method of repairing a seal or element thereof not provided for elsewhere, or subclasses 700+ for general apparatus to assemble or disassemble.
- 371 Unitized seal assembly (e.g., cartridge, etc.):**  
This subclass is indented under subclass 370. Sealing face member wherein the sealing face member and a biasing means therefor are in an operative assembly adapted to fit on one of the parts.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 572+, for a dynamic, circumferential contacting, peripheral, radially sealing, flexible projection (e.g., lip seal, etc.) including a particular mounting, frame, casing, or reinforcement feature for other than a piston.
- 372 Having rotation prevention (i.e., anti-rotation) feature for the sealing face member:**  
This subclass is indented under subclass 371. Unitized cartridge including means to prevent relative rotation between the unitized cartridge and the sealing face member.
- 373 Lug or rib:**  
This subclass is indented under subclass 372. Rotation prevention wherein the rotation prevention means is an inward or outward radially extending projection that fits into a corresponding slot, recess, or groove.
- 374 Retains opposed sealing face members:**  
This subclass is indented under subclass 371. Unitized cartridge including a pair of sealing face members.
- 375 Mounted in housing or casing:**  
This subclass is indented under subclass 371. Unitized seal assembly wherein the unitized seal assembly is for installation in the relatively movable part (e.g., housing, casing, etc.) that encloses the other relatively movable part (e.g., shaft, etc.).
- 376 Snap fit into groove:**  
This subclass is indented under subclass 375. Mounted in housing or casing wherein the unitized seal assembly has a projecting portion to secure by a sudden sharp engagement into a groove in the housing or casing.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 925, for a seal for other than a unitized, relatively rotatable, radially extending, sealing face member that snap fits into a groove of a housing or casing having a snap fit feature for mounting or assembly.
- 377 Particular axial biasing feature:**  
This subclass is indented under subclass 358. Sealing face member including a specific means to force it (i.e., against or apart from the opposing sealing face member) along its rotational axis formed between the relatively movable parts.

**378 Magnetic:**

This subclass is indented under subclass 377. Particular axial biasing feature wherein the axial bias is a polar field.

SEE OR SEARCH THIS CLASS, SUBCLASS:

501, for a dynamic circumferential contact seal for other than a piston and a magnetic means to bias the seal.

629, for a static contact seal for other than an internal combustion engine, or a pipe, conduit, or cable that uses magnetism.

SEE OR SEARCH CLASS:

335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets; subclasses 209+ for a magnet or an electromagnet, configured or arranged to perform external mechanical work but which does not include the external mechanical work.

**379 Particular spring feature:**

This subclass is indented under subclass 377. Particular axial biasing feature wherein the axial bias is an elastic contrivance or body having a specific resilient characteristic.

**380 Made of elastomeric material:**

This subclass is indented under subclass 379. Particular spring feature wherein the spring is manufactured of a rubberlike material.

**381 Frustoconical shape:**

This subclass is indented under subclass 380. Made of elastomeric material wherein the spring has a frustum of a cone configuration.

**382 O-ring shape:**

This subclass is indented under subclass 380. Made of elastomeric material and is circular in both plain view and cross-section.

SEE OR SEARCH THIS CLASS, SUBCLASS:

910, for an O-ring seal.

**383 Imbedded in another material:**

This subclass is indented under subclass 379. Particular spring feature wherein the spring is inside a mass of another substance.

**384 Washerlike shape:**

This subclass is indented under subclass 379. Particular spring feature wherein the spring has a general disclike configuration (e.g., having a frustoconical or "Belleville" profile, incorporating radial or axial corrugation, or including one or more radially extending fingers, etc.).

**385 Arrangement or location:**

This subclass is indented under subclass 379. Particular spring feature wherein the spring has a specific organization or position.

**386 Radially biasing member creates axial bias:**

This subclass is indented under subclass 385. Arrangement or location wherein the spring exerts its force in a direction perpendicular to the rotational axis formed between the relatively movable parts and transform the force into the axial bias.

**387 Fluid pressure:**

This subclass is indented under subclass 377. Particular axial bias feature comprising means to create axial bias by using hydraulics or pneumatics.

**388 Creates counter pressure:**

This subclass is indented under subclass 387. Fluid pressure axial bias wherein the fluid pressure generates a force opposing the axial biasing means that forces the sealing face members together to reduce the axial load exerted at the sealing face.

**389 And bellows or diaphragm:**

This subclass is indented under subclass 387. Fluid pressure axial bias wherein the fluid pressure pushes against a flexible wall member to create axial bias.

SEE OR SEARCH THIS CLASS, SUBCLASS:

315, for a process of static sealing employing a flexible sleeve, boot, or diaphragm.

391+, for a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.) including a flexible sleeve, boot, or diaphragm to provide a secondary seal or driving connection therefor.

504, for a dynamic, circumferential contact seal for other than a piston that accommodates gyratory or oscillatory motion by using a flexible connection having static contact between the seal and one of the relatively movable parts.

634+, for a static, contact, flexible sleeve, boot, or diaphragm seal for other than an internal combustion engine, or a pipe, conduit, or cable.

**390 Particular secondary mounting seal or driving connection:**

This subclass is indented under subclass 358. Sealing face member including a specific seal at a joint or juncture between the sealing face member and the part it mounts on or a specific supporting means linking the sealing face member to the part (e.g., shaft, etc.) relatively rotating to and enclosed by the other part (e.g., housing, casing, etc.).

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

911+, for a seal for other than a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.) having nominal motion transmitting means.

**SEE OR SEARCH CLASS:**

384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclass 142 for a plain radial bearing having a relatively rotatable radially extending sealing face member (e.g., face, mechanical, etc.) axially translatable and rotatable to a shaft.

**391 Flexible sleeve, boot, or diaphragm:**

This subclass is indented under subclass 390. Mounting seal or driving connection including a flexible wall member to accommodate relative axial movement between the sealing face member and one of the parts.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

389, for a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.) including fluid

pressure acting against a bellows or diaphragm to create an axial bias therefor.

504, for a dynamic, circumferential contact seal for other than a piston that accommodates gyratory or oscillatory motion by using a flexible connection having static contact between the seal and one of the relatively movable parts.

634+, for a static, contact flexible sleeve, boot, or diaphragm seal for other than an internal combustion engine, or a pipe, conduit, or cable.

**SEE OR SEARCH CLASS:**

384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclass 141 for a plain radial bearing having a relatively rotatable radially extending sealing face member (e.g., face, mechanical, etc.) including a diaphragm attached to it and a part axially movable therewith.

**392 Between sealing face member and shaft or part relating to shaft:**

This subclass is indented under subclass 391. Flexible sleeve, boot, or diaphragm wherein the flexible sleeve, boot, or diaphragm is between the sealing face member and the part (e.g., shaft, etc.) relatively rotating to and enclosed by the other part (e.g., housing, casing, etc.).

**393 Particular connecting feature to sealing face member:**

This subclass is indented under subclass 391. Flexible sleeve, boot, or diaphragm including a specific means to attach the flexible sleeve, boot, or diaphragm to the sealing face member.

**394 Peripheral radially sealing flexible projection (e.g., lip seal, etc.):**

This subclass is indented under subclass 390. Mounting seal or driving connection wherein the secondary seal is a pliant or resilient extension having a tip for sealing against the sealing face member or one of the parts.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

549+, for a dynamic circumferential contact seal for other than a piston having a peripheral radially sealing flexible projection (e.g., lip seal, etc.).

**395 U- or V-shaped cross-sectional profile:**

This subclass is indented under subclass 394. Peripheral radially sealing flexible projection including another projection forming a U or V in a view of a vertical plane cutting across the seal at right angles to one of its principal horizontal dimensions.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

530, for a dynamic, circumferential contact seal for other than a piston intended to be contained or compressed by a gland member in a packing box having a C, M, U, V, X, or Z cross-sectional seal shape.

647, for a static seal having a C-, U-, or V-shaped cross-sectional seal profile for other than an internal combustion engine, or a pipe, conduit, or cable.

**396 Axially compressed packing:**

This subclass is indented under subclass 390. Mounting seal or driving connection including means to bias the secondary seal into contacting the sealing face member or one of the parts by squeezing it along the rotational axis.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

510+, for a dynamic, circumferential contact seal for other than a piston intended to be contained or compressed by a gland member in a packing box.

**397 Frictionally engaged or interfitting projection and recess:**

This subclass is indented under subclass 390. Mounting seal or driving connection wherein the driving connection is by surface adhesion or a reciprocally fitting protrusion and indent.

**398 Eccentric, gyratory or oscillatory motion:**

This subclass is indented under subclass 358. Sealing face member including accommodation or exhibition of angular or lateral deflec-

tion, circular displacement, eccentric movement, or vibration.

(1) Note. A seal that accommodates gyratory or oscillatory motion is capable of sealing relatively movable parts that move angularly or perpendicularly to its main axis of motion; whereas a floater-type seal has relative motion between the relatively movable parts it seals.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

357, for a dynamic seal for a rotary piston.

503+, for a dynamic, circumferential contact seal for other than a piston that accommodates gyrating or oscillating motion.

916, for a seal having vibration dampening means.

SEE OR SEARCH CLASS:

418, Rotary Expansible Chamber Devices, subclass 55.4 for a helical working member (e.g., scroll, etc.) having planetary or planetating movement including a seal.

**399 Particular sealing face member configuration:**

This subclass is indented under subclass 358. Sealing face member wherein the sealing face member has a specific shape or formation.

SEE OR SEARCH CLASS:

418, Rotary Expansible Chamber Devices, subclass 55.4 for a helical working member (e.g., scroll, etc.) having planetary or planetating movement including a seal.

**400 Hydrodynamic feature:**

This subclass is indented under subclass 399. Particular sealing face member configuration wherein the sealing face member has means to create turbulence against the opposing sealing face.

(1) Note. In a hydrodynamic, relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.), a distance between a sealing member and a part or another sealing member will change when the rotational speed



between relatively movable parts goes from normal operation to slower or non-rotational speeds whereas in a close proximity seal (e.g., contactless, fluent, etc.), the distance is not dependent upon rotational speed.

**401 Fluid passage to the sealing face:**

This subclass is indented under subclass 399. Particular sealing face member configuration wherein the sealing face member has a passageway to permit flow of fluid to the sealing face.

SEE OR SEARCH THIS CLASS, SUBCLASS:

408, for a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.) including means to introduce, circulate, or remove fluid.

**402 Flexible projection (e.g., lip seal, etc.):**

This subclass is indented under subclass 399. Particular sealing face member configuration wherein the surface member is a pliant or resilient extension having a tip for relatively movable contact against the other surface member.

SEE OR SEARCH THIS CLASS, SUBCLASS:

549+, for a dynamic, circumferential contact seal for other than a piston having a peripheral, radially sealing, flexible projection (e.g., lip seal, etc.).

SEE OR SEARCH CLASS:

384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclass 140 for a plain, radial bearing having a flexible, relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.).

**403 Angled or tapered sealing face:**

This subclass is indented under subclass 399. Particular sealing face member configuration wherein the sealing face is at an angle at other than ninety degrees to the axis of rotation at the joint or juncture.

**404 Made of particular material:**

This subclass is indented under subclass 358. Sealing face member wherein the sealing member has a specific composition or substance.

SEE OR SEARCH THIS CLASS, SUBCLASS:

935+, for a seal for other than a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.) made out of a particular material.

SEE OR SEARCH CLASS:

384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclass 482 for a radial antifriction bearing having a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.) made of a resilient sliding surface material.

**405 Ceramic:**

This subclass is indented under subclass 404. Particular material wherein the composition or substance is a fired, clay-containing composition (e.g., porcelain, earthenware, etc.), glass, or refractory composition (e.g., inorganic oxides, carbides, etc.).

**406 Metal:**

This subclass is indented under subclass 404. Particular material wherein the composition or substance is metal.

**407 Elastomeric or plastic:**

This subclass is indented under subclass 404. Particular material wherein the composition or substance is a polymeric material.

**408 Introduction, circulation or removal of fluid:**

This subclass is indented under subclass 358. Sealing face member including means to convey a fluid into, within, or out of the seal face member or one of the relatively movable parts.

SEE OR SEARCH THIS CLASS, SUBCLASS:

401, for a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.) having a

- means for fluid passage in its sealing face.
- 512+, for a dynamic, circumferential contact seal for other than a piston intended to be contained or compressed by a gland member in a packing box having means to introduce or direct a fluid.
- 928, for a seal including means to introduce, circulate, or remove fluid having a pressure relief or venting feature for other than a relatively rotatable, radially extending, sealing face member.
- 930, for a seal for other than a relatively rotatable, radially extending, sealing face member including means to introduce, circulate, or remove fluid having a heating or cooling feature.

**409 Close proximity seal (e.g., contactless, fluent, etc.):**

This subclass is indented under subclass 345. Dynamic seal wherein the sealing means is free of relatively movable sealing contact against the relatively movable parts and capable of acting upon or causing sealed or sealing fluid to oppose the flow of fluid at the joint or juncture between the relatively movable parts.

- (1) Note. This and indented subclasses are for a sealing means not dependent upon the physical contact between a sealing member and a relatively movable part to affect sealing such as abrading or frictional contact that forms a positive seal at the point of contact.
- (2) Note. In a close proximity seal (e.g., contactless, fluent, etc.), a distance between a sealing member and a part or another sealing member is not dependent upon rotational speed between relatively movable parts; whereas in a hydrodynamic, relatively rotatable, radially extending sealing face member (e.g., face, mechanical, etc.) the distance will change when the rotational speed from normal operation to slower or nonrotational speeds.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 301+, for a process of dynamic close proximity sealing (e.g., contactless, fluent, etc.).
- 347+, for diverse and distinct dynamic seals including a close proximity seal.
- 590, for this subclass only, a close proximity seal (e.g., contactless, fluent, etc.) between fixed parts or having a fixed relationship against relatively movable parts.
- 904, for a seal formed by a viscous fluid usually contained by one or more physical contacting-type seals.

**SEE OR SEARCH CLASS:**

- 137, Fluid Handling, residual class for fluid, material handling process or apparatus; subclasses 248+ for a liquid seal between relatively movable, valving parts.
- 417, Pumps, for a general means to move a fluid from one place to another having an inlet and an outlet, subclass 423.11 for a rotary electric motor and rotary nonexpansible chamber pump having sealing means therebetween.

**410 Magnetic:**

This subclass is indented under subclass 409. Close proximity seal wherein the close proximity seal provides a polar field to act upon or cause the sealed or sealing fluid to oppose the flow of fluid.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 501, for a dynamic, circumferential contact seal for other than a piston and a magnetic means to bias the seal.
- 629, for a static contact seal for other than an internal combustion engine, or a pipe, conduit, or cable that uses magnetism.

**SEE OR SEARCH CLASS:**

- 252, Compositions, subclasses 62.51+ for a composition useful for a magnetic purpose or a process for making the composition, not provided for elsewhere.

- 335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets; subclasses 209+ for a magnet or an electromagnet, configured or arranged to perform external mechanical work but does not include the external mechanical work.
- 384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal; subclass 133 for a plain bearing where the seal is a magnetic fluid barrier.
- 411 Gap or clearance:**  
This subclass is indented under subclass 409. Close proximity seal wherein the close proximity seal provides a throttling zone to oppose the flow of fluid while being free of relatively movable sealing contact.
- SEE OR SEARCH CLASS:  
384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclass 488 for a radial antifriction bearing where the seal is a radially extending, annular flange approaching but not contacting a relatively rotating member to substantially but not completely close an annular opening.
- 412 Labyrinth:**  
This subclass is indented under subclass 411. Gap or clearance wherein the gap or clearance seal has more than one throttling zone.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
355, for a dynamic, brush seal that may declare or reveal a labyrinthlike structure.
- SEE OR SEARCH CLASS:  
384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclass 144 for a plain, radial bearing or subclass 480 for a radial, antifriction bearing where the seal is a labyrinth seal.
- 413 Having adjustable member:**  
This subclass is indented under subclass 412. Labyrinth including a repositionable sealing member that allows alteration of the clearance.
- 414 Formed by cellular pockets (e.g., honeycomb, etc.):**  
This subclass is indented under subclass 412. Labyrinth wherein the labyrinth is axially and circumferentially adjacent compartments having openings toward the opposing sealing member or one of the relatively movable parts to provide the throttling zones.
- 415 Having wear resistant, abradable or ablative member:**  
This subclass is indented under subclass 412. Labyrinth including at least a portion of the labyrinth or one of the relatively movable parts made of a material to inhibit deterioration, to promote wear, or to promote burning away.
- 416 Segmented:**  
This subclass is indented under subclass 412. Labyrinth wherein the labyrinth's perimeter is divided into portions.
- 417 Formed by multiple washers:**  
This subclass is indented under subclass 412. Labyrinth wherein the labyrinth is a plurality of substantially flat rings aligned to provide the throttling zones.
- 418 Formed by plural grooves or projections on opposing surfaces:**  
This subclass is indented under subclass 412. Labyrinth wherein the labyrinth is a plurality of projections or grooves on one sealing member oppositely facing an opposing plurality of projections or grooves on another sealing member to provided the throttling zones.
- 419 Interfitting or overlapping:**  
This subclass is indented under subclass 418. Plural grooves or projections wherein the groove or projection extend beyond the inner or outer periphery of the other oppositely facing projection or groove.
- 420 And axially oriented:**  
This subclass is indented under subclass 419. Interfitting or overlapping wherein the opposing projections or grooves extend in a direction

parallel to an axis of rotation formed between the relatively movable parts.

**421 Having installation, removal, assembly, disassembly or repair feature:**

This subclass is indented under subclass 412. Labyrinth including means to aid in mounting, extricating, construction, dismantling or restoration of the seal.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 323, for a seal for well apparatus having an installation, removal, assembly, disassembly, or repair feature.
- 370+, for a relatively rotatable extending sealing face member (e.g., face, mechanical, etc.) having an installation, removal, assembly, disassembly, or repair feature.
- 435, for a piston ring, piston ring expander, or seat therefore having an installation, removal, assembly, disassembly or repair feature.
- 511, for a dynamic circumferential contact seal intended for containment or compression by a gland member in a packing box having an installation, removal, assembly, disassembly, or repair feature.
- 551, for a dynamic, peripheral, radially sealing, flexible projection (e.g., lip seal, etc.) for other than a piston having an installation, removal, assembly, disassembly, or repair feature.
- 598, for a static contact seal for use between parts of an internal combustion engine having an installation, removal, assembly, disassembly or repair feature.
- 609, for a static contact seal intended for insertion between an end-to-end pipe, conduit, or cable joint having an installation, removal, assembly, disassembly, or repair feature.
- 630, for a static contact seal for other than an internal combustion engine, or a pipe, conduit, or cable having an installation, removal, assembly, disassembly, or repair feature.

**SEE OR SEARCH CLASS:**

- 29, Metal Working, for a method of mechanical manufacture or for apparatus to assemble or disassemble, subclass 402.02 for a method of repairing a seal or element thereof not provided for elsewhere, or subclasses 700+ for general apparatus to assemble or disassemble.

**422 Floating ring or bushing:**

This subclass is indented under subclass 411. Gap or clearance wherein the gap or clearance includes an annulus or tubular seal having relative movement at the joint or juncture and having relative movement free of relatively movable, sealing contact against the relatively movable parts.

- (1) Note. A floater-type seal has relative motion between the relatively movable parts it seals between whereas a seal that accommodates gyratory or oscillatory motion is capable of sealing relatively movable parts that move angularly or perpendicularly to its main axis of motion.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 305, for a process of using a dynamic close proximity floating ring or bushing (i.e., contactless).
- 447+, for a floating piston ring seal.
- 579+, for a dynamic, circumferential contact floating ring or bushing seal for other than a piston.
- 585, for a dynamic circumferential contacting elongated sleeve or bushing for other than a piston.

**423 Impeller (e.g., slinger, etc.):**

This subclass is indented under subclass 409. Close proximity wherein the close proximity seal provides a rotary motion transmitting means to direct, deflect, or distribute the sealed or sealing fluid into opposing the flow of fluid.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 400, for a relatively rotatable, radially extending, sealing face member (e.g.,

face, mechanical, etc.) providing a hydrodynamic feature.

**SEE OR SEARCH CLASS:**

384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclasses 132+ for a plain, radial bearing where the seal is a barrier of liquid or gas, or subclass 478 for a radial, antifriction bearing where centrifugal force loads the seal or a liquid or gas forms a sealing barrier.

**424 Rib or groove on radial extending surface:**  
This subclass is indented under subclass 423. Impeller seal wherein the impeller has an axially facing radial surface having a projection or indentation on the surface to act upon the sealed or sealing fluid .

**425 And static sealing means affected by rotational movement:**  
This subclass is indented under subclass 423. Impeller seal including means for sealing between the relatively movable parts at rest or at a transitional speed below the effective operation of the impeller.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

433, for a dynamic seal where centrifugal force affects change in displacement, shape, or contact.  
400, for a relatively rotatable, radially extending sealing face member (e.g., face, mechanical, etc.) providing a hydrodynamic feature.  
929, for a seal for other than a dynamic close proximity impeller seal including a static sealing means affected by rotational movement where a change in operation or condition induces additional leakage control.

**SEE OR SEARCH CLASS:**

384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclasses 135+ for a plain, radial bearing where centrifugal force moves or holds the seal in place, or subclass 478 for a radial antifriction bearing where centrifugal force

loads the seal or a liquid or gas forms a sealing barrier.

**426 Actuated by counterweight:**

This subclass is indented under subclass 425. Static sealing means wherein the static sealing means has a weighted means acted upon by centrifugal force to control the static sealing means.

**427 Forms centrifugal liquid barrier:**

This subclass is indented under subclass 423. Impeller seal for moving or directing the sealed or sealing fluid outwardly from its rotational axis to create a liquid wall at the joint or juncture.

**SEE OR SEARCH CLASS:**

415, Rotary Kinetic Fluid Motors or Pumps, for a means of guiding or confining (e.g., casing, distributing means, etc.) a working fluid (i.e., a liquid or gas that contacts or supports a rotary means that drives or is driven by the liquid or gas), subclass 109 for a rotating shaft having an abutment surface imparting motion in a sealing fluid inside a chamber.

**428 Having cup or chamber inside the impeller or another rotating member:**

This subclass is indented under subclass 427. Centrifugal liquid barrier wherein the impeller or other revolving component has within an open vessel or cavity.

**429 Fluid collector or receiver:**

This subclass is indented under subclass 423. Impeller seal including means to receive fluid from the impeller.

**430 Helical groove or thread on axially extending surface:**

This subclass is indented under subclass 423. Impeller seal wherein the impeller has an indent or projection winding twistlike about its axially extending surface to act upon the sealed or sealing fluid.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

559, for a dynamic, circumferential contact seal for other than a piston having a

peripheral, radially sealing, flexible projection having a hydrodynamic, sealing feature.

**431 Formed by pressurized sealing fluid introduced to form barrier:**

This subclass is indented under subclass 409. Close proximity seal wherein the joint or juncture has sealing fluid introduced into at a pressure equal to or greater than the pressure of the sealed fluid to oppose the flow of the sealed fluid.

SEE OR SEARCH THIS CLASS, SUBCLASS:

408, for a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.) including means to introduce, circulate, or remove fluid.

512+, for a dynamic circumferential contact seal for other than a piston intended to be contained or compressed by a gland member in a packing box having means to introduce or direct a fluid.

926, for a seal for other than a dynamic close proximity seal (e.g., contactless, fluent, etc.) created by pressurized sealing fluid introduced to form a barrier having means to create a fluid pressure equilibrium at a joint or juncture.

927, for a seal for other than a dynamic close proximity seal (e.g., contactless, fluent, etc.) created by pressurized sealing fluid introduced to form a barrier having means to create a fluid pressure different from the sealed fluid pressure.

SEE OR SEARCH CLASS:

384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclasses 132+ for a plain, radial bearing where the seal is a barrier of liquid or gas or subclass 478 for a radial antifriction bearing where centrifugal force loads the seal or a liquid or gas forms a sealing barrier.

**432 External device or system:**

This subclass is indented under subclass 431. Pressurized sealing fluid including an enclosure for the joint or juncture and means outside the enclosure to introduce the pressurized sealing fluid.

SEE OR SEARCH THIS CLASS, SUBCLASS:

513, for a dynamic, circumferential contact seal for other than a piston intended to be contained or compressed by a gland member in a packing box having means to introduce or direct a fluid having an external device or system.

930, for a seal for other than a dynamic close proximity pressurized sealing fluid barrier including an external device or system having a heating or cooling feature.

**433 Centrifugal force affects change in displacement, shape or contact:**

This subclass is indented under subclass 345. Dynamic seal wherein the dynamic seal has an inertial force repelling the sealing means away from its axis of rotation to move, deform, or alter its engagement to another sealing member or relatively movable part.

SEE OR SEARCH THIS CLASS, SUBCLASS:

425+, for a dynamic, close proximity impeller (e.g., slinger, etc.) seal having a static sealing means affected by rotational movement.

929, for a seal for other than a dynamic seal where centrifugal force affects displacement, shape, or contact where a change in operation or condition induces additional leakage control.

SEE OR SEARCH CLASS:

384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclasses 135+ for a plain, radial bearing where centrifugal force moves or holds the seal in place or subclass 478 for a radial antifriction bearing where centrifugal force

loads the seal or a liquid or gas forms a sealing barrier.

**434 Piston ring or piston ring expander or seat therefor:**

This subclass is indented under subclass 345. Dynamic seal comprising an annular seal provided for a part (i.e., a piston) that reciprocates along an axis of an enclosing wall and the seal is for engaging the wall; means to outwardly bias the seal against the enclosing wall; or means (e.g., a seat, etc.) on the part reciprocating along the axis of the enclosing wall to locate or retain the seal or biasing means in an operative position.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 310, for a process of dynamic sealing employing a piston ring for an internal combustion engine.
- 311, for a process of dynamic sealing employing a flexible ring.
- 909, for a seal having similar sealing structures for a piston and rod.
- 910, for an O-ring seal.

SEE OR SEARCH CLASS:

- 29, Metal Working, for a method of mechanical manufacture or apparatus to assemble or disassemble, subclasses 888.07+ for a method of piston ring or packing manufacture.
- 92, Expansible Chamber Devices, subclasses 172+ for more than nominal detailed structure of a piston except where limited to detailed structure (e.g., a seat, a fluid passageway in seat, etc.) solely intended to cooperate with a piston ring or piston ring expander.
- 100, Presses, subclass 269.21 for a seal or gasket around a piston for a fluid actuated reciprocating press.
- 188, Brakes, for means of retarding motion of or stopping of machines; subclasses 72.4+ for a fluid pressure piston axially actuating a brake element or housing against a wheel that may include a seal, or subclass 322.18 for an internal resistance motion retarder including a thrust component used to vary volume in a fluid-filled chamber having a particular retarder compo-

nent structure with a dynamic sealing ring between a piston and cylinder.

**435 Having installation, removal, assembly, disassembly or repair feature:**

This subclass is indented under subclass 434. Piston ring, expander, or seat including means to aid in mounting, extricating, construction, dismantling, or restoration of the seal.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 323, for a seal for well apparatus having an installation, removal, assembly, disassembly, or repair feature.
- 370+, for a relatively rotatable extending sealing face member (e.g., face, mechanical, etc.) having an installation, removal, assembly, disassembly, or repair feature.
- 421, for a close proximity labyrinth seal having an installation, removal, assembly, disassembly, or repair feature.
- 511, for a dynamic, circumferential contact seal intended for containment or compression by a gland member in a packing box having an installation, removal, assembly, disassembly, or repair feature.
- 551, for a dynamic peripheral radially sealing flexible projection (e.g., lip seal, etc.) for other than a piston having an installation, removal, assembly, disassembly, or repair feature.
- 598, for a static contact seal for use between parts of an internal combustion engine having an installation, removal, assembly, disassembly, or repair feature.
- 609, for a static, contact seal intended for insertion between an end-to-end pipe, conduit, or cable joint having an installation, removal, assembly, disassembly, or repair feature.
- 630, for a static, contact seal for other than an internal combustion engine, or a pipe, conduit, or cable having an installation, removal, assembly, disassembly, or repair feature.

## SEE OR SEARCH CLASS:

29, Metal Working, for a method of mechanical manufacture or apparatus to assemble or disassemble, subclasses 222+ for an apparatus to insert or remove a piston ring, or subclass 402.02 for a method of repairing a seal or element thereof not provided for elsewhere.

- 436 Piston ring having peripheral radially sealing flexible projection (e.g., piston cup, etc.):**  
This subclass is indented under subclass 434. Piston ring including a pliant or resilient extension having a tip for relative reciprocating contact against the enclosing wall.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

309, for a process of dynamic sealing employing a peripheral, radially sealing, flexible projection (e.g., lip seal, piston cup, etc.).

549+, for a dynamic circumferential contact seal for other than a piston having a peripheral, radially sealing, flexible projection (e.g., lip seal, etc.).

- 437 Having particular mounting, retaining or supporting feature:**  
This subclass is indented under subclass 436. Peripherally, radially sealing, flexible projection including specific means to fasten, secure, or back the piston ring on the piston.

- 438 Having C, U, or V cross-sectional profile:**  
This subclass is indented under subclass 436. Peripherally radially sealing flexible projection wherein the piston ring has a C-, U-, or V-shape in a view of a vertical plane cutting across the piston ring at right angles to one of its principle horizontal dimensions.

- 439 Axially facing cup:**  
This subclass is indented under subclass 438. C, U, or V cross-sectional profile wherein the C-, U-, or V-shape or form is radially extending to the reciprocating axis of the piston.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

335, for a seal for well apparatus having an axially facing cup shape.

- 440 Piston ring surface of dissimilar material or hardness:**

This subclass is indented under subclass 434. Piston ring including a surface of different material, hardness, or density from the rest of the piston ring.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

569, for a dynamic, circumferential contact seal for other than a piston having a peripheral radially sealing flexible extending portion (e.g., lip seal, etc.) including a lining or insert.

935+, for a seal for other than a piston ring surface made out of a particular material.

- 441 Insert:**

This subclass is indented under subclass 440. Piston ring wherein the surface of the piston ring has the different material, hardness, or density pushed into it.

- 442 Surface coating, plating or impregnation:**

This subclass is indented under subclass 440. Piston ring wherein the use of chemical infusion (e.g., nitriding, etc.) provides a different material, hardness, or density as a layer on the surface or near the surface.

- 443 Nitrided:**

This subclass is indented under subclass 442. Piston ring wherein the chemical infusion of nitrogen increases the nitrogen content of the surface.

## SEE OR SEARCH CLASS:

148, Metal Treatment, subclass 238 for a process of nitriding using an externally supplied nitrogen source or subclasses 317+ for a stock product of the nitriding process.

- 444 Chromium:**

This subclass is indented under subclass 442. Piston ring wherein the surface has chrome provided as a layer on the surface or chemically infused near the surface.



## SEE OR SEARCH CLASS:

205, Electrolysis: Processes, Compositions Used Therein, and Methods of Preparing the Compositions; for a process of making an electrolytic coating not provided for elsewhere, subclasses 178+ for multiple superposed coatings having at least one chromium-containing coating, or subclasses 283+ for a predominately chromium coating.

- 445 Rotation limiting feature (i.e., anti-rotation):**  
This subclass is indented under subclass 434. Piston ring, expander, or seat including means to limit or prevent relative rotation between any combination of the piston ring, piston ring expander, or seat, or pluralities of the piston ring or piston ring expander.

- 446 Between rings:**  
This subclass is indented under subclass 445. Piston ring or piston ring expander wherein the feature to limit rotation (i.e., antirotation) is between any combination of the piston ring or piston ring expander, or between any combination of more than one piston ring or piston ring expander.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

490, for a piston ring having sectional structure including a component ring of eccentric or variable thickness.

- 447 Floating piston ring:**  
This subclass is indented under subclass 434. Piston ring including relative movement to the seat.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

305, for a process of using a dynamic close proximity floating ring or bushing (i.e., contactless).  
422, for a dynamic, close proximity floating ring or bushing (i.e., contactless).  
579+, for a dynamic, circumferential, contact floating ring or bushing seal for other than a piston.

**448 Material other than metal:**

This subclass is indented under subclass 447. Floating piston ring consisting of a substance different from metal.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

468, for a separate particular piston ring expander means made out of a material other than metal.

**449 Particular piston seat:**

This subclass is indented under subclass 434. Seat therefor wherein the part (i.e., a piston) has more than a nominal groove structure on its cylindrical face to locate or retain the piston ring or piston ring expander.

- (1) Note. The declaration of a groove or opposing sidewalls connected by an end wall is nominal structure.

**450 Helical form:**

This subclass is indented under subclass 449. Particular piston seat wherein the groove is a helix or spiral along the cylindrical face of the piston and accommodates a similarly shaped piston ring or piston ring expander.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

458, for a piston ring having a single piece noncircular or multi-turn (e.g., helical, spiral, oblong, elliptical, polygonal, etc.) shape.

**451 Stepped walls:**

This subclass is indented under subclass 449. Particular piston seat wherein the groove has a nonuniform axial width and walls that are at a right angle to each other.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

586, for a dynamic, circumferential contact seal for other than a piston seated in a groove having stepped walls.

**452 Oblique wall:**

This subclass is indented under subclass 449. Particular piston seat wherein the groove has a nonuniform axial width and a tapered or inclined wall.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

587, for a dynamic, circumferential contact seal for other than a piston seated in a groove having an oblique wall.

**453 More than one oblique wall:**

This subclass is indented under subclass 452. Oblique wall wherein the groove has tapered or inclined walls.

**454 Having parallel walls:**

This subclass is indented under subclass 453. More than one oblique wall wherein the groove has any tapered or inclined walls that are parallel to each other.

**455 Arcuate wall:**

This subclass is indented under subclass 449. Particular piston seat wherein the groove has a curved wall.

**456 Coating, treatment or wall insert:**

This subclass is indented under subclass 449. Particular piston seat wherein the groove has a portion subject to or formed by a substance, action or material addition.

**457 Having passageway for fluid return, pressure relief or venting:**

This subclass is indented under subclass 449. Particular piston seat wherein the groove has an opening for return of fluid or for releasing or relieving fluid pressure.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

928, for a seal having a pressure relief or venting feature for other than a piston ring seat including a passageway for fluid return, pressure relief, or venting.

**458 Piston ring having single piece noncircular or multiturn (e.g., helical, spiral, oblong, elliptical, polygonal, etc.) shape:**

This subclass is indented under subclass 434. Piston ring wherein the piston ring has a helical or spiral form or shape other than circular in either a relaxed or stressed state.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

450, for a piston groove having a helical form intended to accommodate a similarly shaped piston ring or piston ring expander.

**459 Piston ring including exposed port, slot, pocket, groove, channel, recess, or bevel:**

This subclass is indented under subclass 434. Piston ring including an uncovered opening, incline, removed, or indented portion on an outer peripheral surface of the piston ring.

(1) Note. The enclosing wall or piston can cover the exposed or passageway, slot, pocket, groove, channel, recess, or bevel but not another ring or expander.

(2) Note. An expander or spacer for spacing one or more separate piston rings is not a piston ring even if it directly engages the enclosing wall.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

477+, for a particular piston ring expander having a slotted or undulating circular band having an inclined or axially facing seat for the piston ring.

484, for a piston ring expander having a radially extending tongue formed from it.

**460 Circumferential groove, channel, recess, or bevel:**

This subclass is indented under subclass 459. Piston ring wherein the groove, channel, recess, or bevel extends substantially annularly about the outer peripheral surface of the piston ring.

**461 Axially spaced:**

This subclass is indented under subclass 460. Piston ring wherein the annular groove, channel, recess or bevel has another annular groove, channel, recess, or bevel spaced axially from it.

**462 Ports:**

This subclass is indented under subclass 461. Axially spaced wherein the piston ring has through holes.

- (1) Note. A “port” or “through hole” is a passageway extending through the ring and totally enclosed by the material of the ring.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 463, for a piston ring having an exposed circumferential groove, channel, recess, or bevel, and ports.
- 464, for a piston ring having an exposed port, slot, pocket, groove, channel, recess, or bevel and circumferentially spaced ports.

#### **463 Ports:**

This subclass is indented under subclass 460. Piston ring wherein the piston ring has through holes.

- (1) Note. A “port” or “through hole” is a passageway extending through the ring and totally enclosed by the material of the ring.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 462, for a piston ring having exposed axially spaced circumferential grooves, channels, recesses or bevels, and ports.
- 464, for a piston ring having an exposed port, slot, pocket, groove, channel, recess, or bevel and circumferentially spaced ports.

#### **464 Circumferentially spaced ports:**

This subclass is indented under subclass 459. Piston ring wherein the piston ring has annularly spaced through holes.

- (1) Note. A “port” or “through hole” is a passageway extending through the ring and totally enclosed by the material of the ring.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 462, for a piston ring having exposed axially spaced circumferential grooves, channels, recesses or bevels and ports.

- 463, for a piston ring having an exposed circumferential groove, channel, recess or bevel, and ports.

#### **465 Circumferentially spaced slots, pockets, grooves, channels, recesses, or bevels:**

This subclass is indented under subclass 459. Piston ring wherein the piston ring has annularly spaced pockets, grooves, channels, recesses, or bevels.

#### **466 Piston ring displays twisting or torsion:**

This subclass is indented under subclass 434. Piston ring wherein the piston ring's configuration exhibits a rotating or cocking movement during the reciprocating operation of the piston.

#### **467 Particular piston ring expander:**

This subclass is indented under subclass 434. Piston ring expander wherein the piston ring has inherent specific biasing means or a separate specific biasing means to outwardly bias the piston ring against the enclosing wall.

- (1) Note. Do speculate on the resilient nature of the ring. There must be some indication of this resilient nature by a ring being defined as resilient or expandable, or by a structure causing expansion (e.g., wedging surfaces forcing a ring outwardly, etc.).

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 447+, for expansion means created by the relative movement of a floating piston ring in its groove.

#### **468 Separate and other than metal:**

This subclass is indented under subclass 467. Particular piston ring expander wherein the biasing means is distinct from the piston ring and made out of a material that differs from metal.

#### **469 Bias limiting feature:**

This subclass is indented under subclass 467. Particular piston ring expander including means to restrict the extent of radial expansion.

- SEE OR SEARCH THIS CLASS, SUB-CLASS:
- 445+, for a piston ring or piston ring expander or seat therefor having a feature to limit rotation between any combination of piston ring, piston ring expander or seat, pluralities of the piston ring, or piston ring expander.
- 494+, for a piston ring having a gap and a separate bridging piece for the gap.
- 496+, for a single piece split piston ring having opposed asymmetrical mirrored ends.
- 498+, for a single piece split piston ring having other than opposed asymmetrical mirrored ends.
- 470 Adjustable loading feature:**  
This subclass is indented under subclass 467. Particular piston ring expander including means to alter the force exerted by the piston ring expander.
- 471 Thermal expansion feature:**  
This subclass is indented under subclass 467. Particular piston ring expander wherein the piston ring expander is responsive to heat.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
- 931+, for a seal for other than a piston ring expander including a temperature responsive feature having a temperature responsive feature.
- 472 Annular expander nested in annular groove of the piston ring:**  
This subclass is indented under subclass 467. Particular piston ring expander wherein the piston ring expander is annular and intended to be at least partially received by the piston ring having an annular recess of any cross-sectional shape (e.g., tapered, etc.) that will partially receive the annular piston ring expander.
- 473 Between piston rings:**  
This subclass is indented under subclass 472. Particular annular piston ring expander wherein the piston ring expander nests in annular grooves formed between piston rings.
- 474 And contacting surfaces therebetween are complementary:**  
This subclass is indented under subclass 472. Particular annular piston ring expander wherein the piston ring expander provides an annular surface complementary to the opposing annular recess surface of the piston ring.
- 475 Having more than one pair of such surfaces:**  
This subclass is indented under subclass 474. Contacting surfaces therebetween are complementary wherein the piston ring expander provides complementary surfaces for opposing annular recess surfaces of the piston ring.
- 476 Inclined or beveled groove contacting expander having dissimilar contour:**  
This subclass is indented under subclass 472. Particular annular piston ring expander provides an annular surface having a profile other than a slanting or sloping surface of the annular recess of the piston ring.
- 477 Slotted or undulating circular band including inclined or axially facing seat for the piston ring:**  
This subclass is indented under subclass 467. Particular piston ring expander wherein the piston ring expander is a resilient annular band having openings therein or having a wavy or corrugated contour, and a radially extending surface intended to space, position, retain, or bias a separate and distinct piston ring.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
- 459+, for a piston ring having an exposed port, slot, pocket, groove, channel, recess, or bevel
- 485, for a piston ring expander having an undulating structure providing an axially extending face against the inner periphery of the piston ring.
- 478 Axially spaced axially facing seats:**  
This subclass is indented under subclass 477. Particular piston ring expander wherein the piston ring expander has more than one radially extending surface intended to space, position, retain, or bias separate and distinct piston rings along the piston's reciprocating axis.

**479 Circular band having radially displaced undulations:**

This subclass is indented under subclass 478. Axially spaced, axially facing seats wherein the annular band has a wavy or sinuous structure parallel to the piston's reciprocating axis.

**480 Circular band having axially displaced undulations:**

This subclass is indented under subclass 478. Axially spaced, axially facing seats wherein the annular band has a wavy or sinuous structure radially perpendicular to the piston's reciprocating axis.

**481 U-shaped circular band radially directed either inwardly or outwardly through out its circumference:**

This subclass is indented under subclass 478. Axially spaced, axially facing seats wherein the annular band has a channel-shaped cross-section oriented radially in either an inward or outward facing direction throughout its perimeter.

- (1) Note. The U- or channel-shaped structure does not have to be continuous or unbroken throughout its circumference.

**482 Circumferentially spaced separately seated radially acting bias feature:**

This subclass is indented under subclass 467. Particular piston ring expander wherein the piston ring expander has peripherally spread apart, individually positioned, resilient members acting in a direction perpendicular to the piston's axis of reciprocation.

**483 Disposed in socket or about pin:**

This subclass is indented under subclass 482. Particular piston ring expander wherein the radially acting bias members are received and held in circumferentially spaced hollows of or arranged about circumferentially spaced projections.

**484 Radially extending tongue formed from expander:**

This subclass is indented under subclass 467. Particular piston ring expander wherein the piston ring expander has a radially inward or outward resilient biasing projection fabricated from the piston ring expander.

**485 Undulating periphery providing axially extending face against inner perimeter of the piston ring:**

This subclass is indented under subclass 467. Particular piston ring expander wherein the piston ring expander provides a circumferential, radial facing, wavy, or corrugated structure against an opposing inside circumference of the piston ring.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 477+, for a particular piston ring expander, having a slotted or undulating circular band, having an inclined or axially facing seat for the piston ring.

**486 Bias feature adjoining opposed ends of split or segmented piston ring:**

This subclass is indented under subclass 467. Particular piston ring expander wherein the piston ring expander is contacting or near a piston ring divided into portions forming facing ends along its perimeter.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 487, for a segmented piston ring expander.  
493, for a segmented piston ring.

**487 Segmented:**

This subclass is indented under subclass 467. Particular piston ring expander wherein the piston ring expander's perimeter is divided into portions.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 486, for a piston ring expander adjoining opposed ends of a split or segmented piston ring.  
493, for a segmented piston ring.

**488 For axially adjacent piston rings:**

This subclass is indented under subclass 467. Particular piston ring expander wherein the piston ring expander engages piston rings that adjoin each other along their radially extending circumferences.

- (1) Note. The ring may be separate or may be part of a unitary, overlapping structure forming a helix.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

489+, for a piston ring having sectional structure.

**489 Sectional piston ring structure:**

This subclass is indented under subclass 434. Piston ring consisting of more than one component.

- (1) Note. A piston ring placed as an original should have more than nominal structure before crossing in this and indented subclasses.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

446, for a piston ring or piston ring expander having means to limit rotation between another piston ring or piston ring expander.

488, for a piston ring expander engaging axially adjacent piston rings.

548, for a dynamic, segmented ring circumferentially contacting seal for other than piston having complementary interfitting adjoining rings.

**490 Eccentric or variable thickness component ring:**

This subclass is indented under subclass 489. Sectional piston ring wherein the component has a radial periphery of changing radius or an axial periphery of changing thickness.

- (1) Note. The shape of the sectional piston ring formed by the component rings can be eccentric or concentric or of uniform or variable thickness.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

458, for a piston ring having a single piece, noncircular, or multiturn (e.g., helical, spiral, oblong, elliptical, polygonal, etc.) shape.

**491 C, L, T, U, V, or Z cross-sectional profile:**

This subclass is indented under subclass 489. Sectional piston ring wherein the component has a C-, L-, T-, U-, V-, or Z-shape in a view of a vertical plane cutting across the component

ring at right angles to one of its principal horizontal dimensions.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

530, for a dynamic, circumferential, contact seal for other than a piston intended to be contained or compressed by a gland member in a packing box having a C, M, U, V, X, or Z cross-sectional seal shape.

**492 Three or more sections:**

This subclass is indented under subclass 491. Sectional piston ring wherein the sectional piston ring has at least three component rings.

**493 Segmented piston ring:**

This subclass is indented under subclass 434. Piston ring wherein the piston ring's perimeter is divided into portions.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

486, for a piston ring expander adjoining opposed ends of a split or segmented piston ring.

487, for a segmented, piston ring expander.

543+, for a dynamic, segmented ring circumferentially contacting seal for other than a piston.

**494 Separate bridging piece for gap in piston ring:**

This subclass is indented under subclass 434. Piston ring wherein the piston ring includes a break providing opposed ends and a means separate from the piston ring for closing the gap therebetween or for connecting the ends together.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

486, for a piston ring expander adjoining opposed ends of a split or segmented piston ring.

546+, for a dynamic, segmented ring circumferentially contacting seal for other than a piston having a particular end structure.

631, for a static, contact seal for other than an internal combustion engine, or a pipe, conduit, or cable having a split including end joining structure.

**495 Secured to end:**

This subclass is indented under subclass 494. Bridging piece wherein the bridging piece fastens to one or both of the opposing ends.

**496 Split single piece piston ring having opposed asymmetrical mirrored ends:**

This subclass is indented under subclass 434. Piston ring wherein the piston ring is an annulus including only a gap providing opposed ends that are of substantially identical shape having opposite orientation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

546+, for a dynamic segmented ring circumferentially contacting seal for other than a piston having a particular end structure.

631, for a static contact seal for other than an internal combustion engine, or a pipe, conduit, or cable having a split including end joining structure.

**497 Arcuate or beveled mating surfaces:**

This subclass is indented under subclass 496. Single piece split piston ring wherein the opposed asymmetrical mirrored ends are complementary curved or angular engaging surfaces.

**498 Split single piece piston ring having other than opposed asymmetrical mirrored ends:**

This subclass is indented under subclass 434. Piston ring wherein the piston ring is an annulus including only a gap providing opposed ends that are of substantially dissimilar shape even when considering opposite orientation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

546+, for a dynamic, segmented ring circumferentially contacting seal for other than a piston having a particular end structure.

631, for a static contact seal for other than an internal combustion engine, or a pipe, conduit, or cable having a split including end joining structure.

**499 Arcuate or beveled mating surfaces:**

This subclass is indented under subclass 498. Split single piece piston ring wherein the opposed ends have curved or angular engaging surfaces.

**500 Circumferential contact seal for other than piston:**

This subclass is indented under subclass 345. Dynamic seal wherein the seal has a radial peripheral surface contact against one or more of the relatively movable parts and for other than a part (i.e., a piston) that reciprocates along an axis to an enclosing wall and where the seal is for engaging the wall.

SEE OR SEARCH THIS CLASS, SUBCLASS:

311, for a process of dynamic sealing employing a flexible ring.

354, for a dynamic seal for a helically threaded part.

907, for a passageway in a rod or shaft.

908, for a seal for use in a rotating and reciprocating arrangement.

909, for a seal having similar sealing structures for a piston and rod.

910, for an O-ring seal.

SEE OR SEARCH CLASS:

92, Expansible Chamber Devices, subclass 168 for a nonmetallic seal means between a piston or a part moved by the piston and a cylinder end portion.

123, Internal-Combustion Engines, subclass 90.37 for a poppet valve mechanism's lubrication system's seal or shield that includes those mounted on a valve stem.

175, Boring or Penetrating the Earth, for processes and means for initially forming or radially enlarging an elongated hole in the earth in situ, subclass 359 for mutually contacting cutter supports that are circumferentially displaced axes for a rolling cutter bit or rolling cutter bit element with seal details, or subclass 371 for a rolling cutter bit or rolling cutter bit element with seal details.

- 188, Brakes, for means of retarding motion of or stopping of machines; subclass 322.17 for an internal resistance motion retarder including a thrust component used to vary volume in a fluid-filled chamber having a particular retarder component structure with a dynamic sealing ring or flexible boot between a piston rod and cylinder.
- 241, Solid Material Comminution or Disintegration, subclass 216 for cooperating comminuting surfaces having a gyratory member that includes rotary motion and means to seal the comminuting zone from a drive or other moving parts.
- 251, Valves and Valve Actuation, for means to close or restrict a flow of fluid through a passage by a definite predetermined motion of the means combined with a seal, subclass 214 for a valve actuated by a mechanical movement means and having a particularly associated sealing means for either.
- 301, Land Vehicles: Wheels and Axles, for a wheel or axle, or where they are a dominant feature when combined with other vehicle structure; subclass 123 for a seal to exclude dirt or dust from a wheel or axle bearing.
- 305, Wheel Substitutes for Land Vehicles, subclasses 100+ for a flexible track joint structure (e.g., pin, link, etc.) including a seal, deflector, or scraper.
- 384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclasses 151+ for a plain radial bearing where the seal's material is resilient and on the outer area of the bearing or shaft.
- 417, Pumps, for a general means to move a fluid from one place to another having an inlet and an outlet, subclass 423.11 for a rotary electric motor and rotary nonexpansible chamber pump having sealing means therebetween.
- 440, Marine Propulsion, for a vessel and a device (e.g., propeller, impeller, etc.) other than a sail to move the vessel through water, subclass 112 for means to mount an engine within the vessel's hull and sealing means for a propeller shaft that pierces the hull.
- 501 And magnetic bias:**  
This subclass is indented under subclass 500. Dynamic, circumferential contact seal including a polar field to bias the seal.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
378, for a relatively rotatable, radially extending sealing face member (e.g., face, mechanical, etc.) including a magnetic axial bias therefor.  
629, for a static contact seal for other than an internal combustion engine, or a pipe, conduit, or cable that uses magnetism.
- SEE OR SEARCH CLASS:  
252, Compositions, subclasses 62.51+ for a composition useful for a magnetic purpose or a process for making the composition, not provided for elsewhere.  
335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets; subclasses 209+ for a magnet or an electromagnet, configured or arranged to perform external mechanical work but does not include the external mechanical work.
- 502 For valve stem in internal combustion engine:**  
This subclass is indented under subclass 500. Dynamic, circumferential contact seal wherein the seal is at the joint or juncture between a reciprocating part (i.e., stem of a valve controls the flow of gas in an internal combustion engine) and a housing part (i.e., a guide for a valve in an internal combustion engine).
- SEE OR SEARCH CLASS:  
123, Internal-Combustion Engines, subclass 188.6 for a seal in combination with a valve stem of an intake, exhaust or fuel valve of an internal combustion engine having a stationary opening (i.e., seat) and moving closure (i.e., head).



**503 Accommodates gyratory or oscillatory motion:**

This subclass is indented under subclass 500. Dynamic, circumferential contact seal wherein the seal permits angular or lateral deflection, circular displacement, eccentric movement, or vibration of one or more of the relatively movable parts.

- (1) Note. A seal that accommodates gyratory or oscillatory motion is capable of sealing relatively movable parts that move angularly or perpendicularly to its main axis of motion whereas a floater type seal has relative motion between the relatively movable parts it seals.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 398, for a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.) that accommodates or exhibits eccentric, gyratory, or oscillatory motion.
- 916, for a seal having vibration dampening means.

**504 Flexible connection between seal and another part:**

This subclass is indented under subclass 503. Accommodates gyratory or oscillatory motion wherein the seal for use on one of the relatively movable parts (e.g., shaft, rod, etc.) includes a compliant link (e.g., flexible sleeve, flexible boot, flexible diaphragm, etc.) that accommodates oscillatory or gyratory motion between and secures the seal and the other of the relatively movable parts (e.g., casing, housing, etc.).

- (1) Note. The seal may be part of and include a stuffing box.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 315, for a process of static sealing employing a flexible sleeve, boot, or diaphragm.
- 389, for a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.) including fluid pressure acting against a bellows or

diaphragm to create an axial bias therefor.

- 391+, for a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.) including a flexible sleeve, boot, or diaphragm to provide a secondary seal or driving connection therefor.
- 634+, for a static contact flexible sleeve, boot, or diaphragm seal for other than an internal combustion engine, or a pipe, conduit, or cable.

SEE OR SEARCH CLASS:

- 464, Rotary Shafts, Gudgeons, Housings, and Flexible Couplings for Rotary Shafts, subclasses 173+ for a flexible boot for a joint to transmit rotary torque.

**505 Oscillates perpendicularly to axis of motion:**

This subclass is indented under subclass 503. Accommodates gyratory or oscillatory motion wherein the seal permits side-to-side deflection of one of the relatively movable parts at right angles to an axis of movement between the relatively movable parts.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 356, for a dynamic seal for use in a journal box that may include a seal mounted for lateral movement to an axis of seal chamber.

**506 Arcuate bearing surface:**

This subclass is indented under subclass 503. Accommodates gyratory or oscillatory motion wherein the seal or one of the relatively movable parts has a curved bearing surface.

**507 Partially spherical:**

This subclass is indented under subclass 506. Arcuate bearing surface wherein the arcuate bearing surface is somewhat circular, ball-like, or round.

SEE OR SEARCH CLASS:

- 384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclasses 145+ for a plain radial bearing where the seal conforms to a bearing surface that has

- a shape of sphere to permit angular or lateral movement.
- 403, Joints and Connections, for a joint or connection structure that goes beyond providing an environment for a seal; subclasses 135+ for a ball and socket that may have a seal at the bearing interface.
- 508 Axially spring biased:**  
This subclass is indented under subclass 503. Accommodates gyratory or oscillatory motion including an elastic contrivance or body to force the seal in a direction along an axis of motion of the relatively movable parts.
- 509 Coaxial spring:**  
This subclass is indented under subclass 508. Axial spring bias wherein the spring has a symmetrical axis substantially common to the axis of motion formed by the relatively movable parts.
- 510 Contained or compressed by gland member in packing box:**  
This subclass is indented under subclass 500. Dynamic, circumferential contact seal wherein the seal is intended for use in a chamber having an axially opened end to receive the seal and a member that substantially closes the open end to retain or squeeze the seal within the chamber while having an opening for passage for one of the relatively movable parts.
- (1) Note. A biasing spring is not a gland or follower.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 308, for a process of dynamic sealing employing a seal to be contained or compressed by a gland member in a packing box.
- 329+, for a seal for well apparatus where the seal is in a packing box contained or compressed by a gland member.
- 396, for a relatively rotatable radially extending sealing face member (e.g., face, mechanical, etc.) including a secondary mounting seal consisting of axially compressed packing.
- 620+, for a static contact seal intended for use on a pipe, conduit, or cable including a clamping gland.
- SEE OR SEARCH CLASS:
- 384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclass 149 for a plain radial bearing, or subclass 483 for a radial antifriction bearing having radially contained seal having an axially acting follower.
- 511 Having installation, removal, assembly, disassembly or repair feature:**  
This subclass is indented under subclass 510. Seal for the gland and packing box including means to aid in mounting, extricating, construction, dismantling or restoration of the seal.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 323, for a seal for well apparatus having an installation, removal, assembly, disassembly, or repair feature.
- 370+, for a relatively rotatable extending sealing face member (e.g., face, mechanical, etc.) having an installation, removal, assembly, disassembly, or repair feature.
- 435, for a piston ring, piston ring expander or seat therefore having an installation, removal, assembly, disassembly, or repair feature.
- 551, for a dynamic peripheral radially sealing flexible projection (e.g., lip seal, etc.) for other than a piston having an installation, removal, assembly, disassembly, or repair feature.
- 598, for a static contact seal for use between parts of an internal combustion engine having an installation, removal, assembly, disassembly, or repair feature.
- 609, for a static contact seal intended for insertion between an end-to-end pipe, conduit, or cable joint having an installation, removal, assembly, disassembly, or repair feature.
- 630, for a static contact seal for other than an internal combustion engine, or a pipe, conduit, or cable having an installation, removal, assembly, disassembly, or repair feature.

## SEE OR SEARCH CLASS:

29, Metal Working, for a method of mechanical manufacture or for apparatus to assemble or disassemble, subclass 402.02 for a method of repairing a seal or element thereof not provided for elsewhere, or subclasses 700+ for general apparatus to assemble or disassemble.

**512 Fluid introducer or director:**

This subclass is indented under subclass 510. Seal for the gland and packing box wherein the seal, gland or packing box includes means to convey a fluid into, within or out of the seal, gland or packing box.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

408, for a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.) including means to introduce, circulate, or remove fluid.

431+, for a dynamic close proximity seal (e.g., contactless, fluent, etc.) created by pressurized sealing fluid introduced to form a barrier.

918, for a seal for other than dynamic circumferential contact seal for other than a piston contained or compressed by a gland member in a packing box having a filter or fluid separator.

927, for a seal for other than dynamic circumferential contact seal for other than a piston contained or compressed by a gland member in a packing box having means to create a fluid different from the sealed fluid pressure.

## SEE OR SEARCH CLASS:

184, Lubrication, for a unitized lubrication means removable or installable from one machine to on another and intended to lubricate a bearing part in a machine, subclasses 24+ for a piston rod lubricator.

**513 External device or system:**

This subclass is indented under subclass 512. Fluid introduction or director wherein the means is an apparatus or organization of apparatuses located outside the packing box.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

930, for a seal for other than a dynamic seal to be contained or compressed by a gland member in a packing box including an external device or system to introduce or direct a fluid having a heating or cooling feature.

**514 Drain, pressure relief or vent:**

This subclass is indented under subclass 512. Fluid introduction or director including means to direct fluid away from or for alleviating fluid stress or strain.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

928, for a seal having a pressure relief or venting feature for other than a dynamic circumferential contact seal, for other than a piston intended to be in a packing box contained or compressed by a gland member and having a drain, pressure relief, or vent feature.

## SEE OR SEARCH CLASS:

384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclass 479 for a radial antifriction bearing where the seal establishes a pressure or pressure responsive means to load the seal.

**515 Passage through axial facing surface:**

This subclass is indented under subclass 512. Fluid introduction or director wherein the means is a passageway that extends from one radially extending surface to another radial or axial extending surface of the seal, packing box, or gland.

**516 Spacer between seals (e.g., lantern ring, etc.):**

This subclass is indented under subclass 512. Fluid introduction or director wherein the means is a nonsealing member separating seals.

- 517 Between packing boxes:**  
This subclass is indented under subclass 512. Fluid introduction or director wherein the means is between chambers.
- 518 Plural distinct packing boxes:**  
This subclass is indented under subclass 510. Seal for the gland and packing box comprising distinguishable sealing chambers, seals, and glands.
- 519 Segmented packing box:**  
This subclass is indented under subclass 510. Seal for the gland and packing box wherein the chamber is divided into portions.
- 520 Particular gland feature:**  
This subclass is indented under subclass 510. Seal for the gland and packing box wherein the member that substantially closes the open end of the packing box while having an opening for passage for one of the relatively movable parts has a specific characteristic.
- SEE OR SEARCH CLASS:  
384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclass 150 for a plain, radial bearing where mechanical means (e.g., nut, separate resilient elements, etc.) moves the seal.
- 521 Segmented:**  
This subclass is indented under subclass 520. Particular gland feature wherein the gland is divided into portions.
- 522 Spring bias:**  
This subclass is indented under subclass 520. Particular gland feature including an elastic contrivance or body to exert force on the gland.
- 523 Disposed about external bolt or stud:**  
This subclass is indented under subclass 522. Spring bias wherein the spring bias surrounds a fastener or projecting pin located outside the packing box and used to mount the gland to the packing box.
- 524 Eye or T-type bolt:**  
This subclass is indented under subclass 520. Particular gland feature wherein the gland uses a fastening means threaded at one and having a hole, loop, or crosspiece at the other end intended to engage corresponding structure on the gland or packing box.
- 525 Internally threaded:**  
This subclass is indented under subclass 520. Particular gland feature wherein the gland has a radially inward facing projecting helical rib intended to fasten the component to the packing box.
- 526 Externally threaded:**  
This subclass is indented under subclass 520. Particular gland feature wherein the gland has a radially outward facing projecting helical rib intended to fasten the component to the packing box.
- 527 Wear sleeve:**  
This subclass is indented under subclass 510. Seal for the gland and packing box including a tubular member mounted on one of the relatively movable parts intended to protect the one relatively movable part from deterioration from the relatively movable surface contact of the seal.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
571, for a dynamic, circumferential contacting peripheral radially sealing flexible projection (e.g., lip seal, etc.) including a wear sleeve.
- 528 Helically coiled packing:**  
Seal for the gland and packing box under subclass 510 wherein the seal has a spirally wound structure between the parts along their axis of relative motion.
- 529 Having particular cross-sectional seal profile:**  
This subclass is indented under subclass 510. Seal for the gland and packing box wherein the seal has a specific shape in a view of a vertical plane cutting across the seal at right angles to one of its principle horizontal dimensions.

- SEE OR SEARCH THIS CLASS, SUB-CLASS:
- 490, for a piston ring having sectional structure including a component ring of eccentric or variable thickness.
- 548, for a dynamic segmented ring circumferentially contacting seal for other than piston having complementary interfitting adjoining rings.
- 626, for a static contact seal having a particular seal shape intended for use on a pipe, conduit, or cable.
- 530 C-, M-, U-, V-, X-, or Z-shaped:**  
This subclass is indented under subclass 529. Particular cross-sectional seal profile wherein the profile has a U-, V-, C-, M-, X-, or Z-configuration.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
- 491+, for a piston ring having a sectional structure including a component ring having a C, L, T, U, V, or Z cross-sectional profile.
- 567, for a dynamic circumferential contact seal for other than a piston having peripherally radially sealing flexible projections forming a radially facing U or V cross-sectional profile.
- 647, for a static seal having a C-, U-, or V-shaped cross-sectional seal profile for other than an internal combustion engine, or a pipe, conduit, or cable.
- 531 Wedging surface:**  
This subclass is indented under subclass 529. Particular cross-sectional seal profile wherein the profile includes an inclined surface to generate a radial bias.
- 532 Made of elastomer or plastic:**  
This subclass is indented under subclass 531. Wedging surface wherein the seal is a rubber-like material.
- 533 Segmented:**  
This subclass is indented under subclass 531. Wedging surface wherein the seal's perimeter is divided into portions.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
- 543+, for a dynamic segmented ring circumferentially contacting seal for other than a piston.
- 534 Particular seal material or construction:**  
This subclass is indented under subclass 510. Seal for the gland and packing box wherein the seal is of a specific material or has a specific arrangement of material.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
- 935+, for a seal for other than a dynamic circumferential contact seal for other than a piston intended to be contained or compressed by a gland member in a packing box made out of a particular material.
- 535 Composite:**  
This subclass is indented under subclass 534. Particular material or construction wherein the material consists of distinct substances that retain their identities in the material used to form the seal.
- 536 Fibrous component:**  
This subclass is indented under subclass 535. Composite wherein the composite includes a plurality of slender filamentlike strands.
- 537 Braided, woven or twisted:**  
This subclass is indented under subclass 536. Fibrous component wherein the fibrous component has an intertwined structure.
- SEE OR SEARCH CLASS:
- 57, Textiles: Spinning, Twisting, and Twining, for a process or apparatus for spinning, twisting and twining.
- 87, Textiles: Braiding, Netting or Lace Making, a process or apparatus for forming strands or fabrics from yarns, filaments, or strands by braiding, knotting, or intertwisting the strands and the corresponding products or fabrics.
- 139, Textiles: Weaving, for manufacture of fabric by weaving threads.

**538 Distinct sheath or covering:**

This subclass is indented under subclass 535. Composite wherein the composite includes a distinct casing or layer surrounding at least a major portion of an outer periphery of the seal.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

652+, for a static contact seal for other than an internal combustion engine, or a pipe, conduit, or cable having a sheath or covering.

**539 Graphite:**

This subclass is indented under subclass 534. Particular material or construction wherein the specific substance forming the seal is graphite.

**540 Elastomer or plastic:**

This subclass is indented under subclass 534. Particular material or construction wherein the specific substance forming the seal is rubber-like.

**541 Metal:**

This subclass is indented under subclass 534. Particular material or construction wherein the specific substance forming the seal is metal.

**542 Consisting of loose-fill type packing:**

This subclass is indented under subclass 510. Seal for the gland and packing box wherein the seal is a free unshaped packing material.

**543 Segmented ring:**

This subclass is indented under subclass 500. Dynamic, circumferential contact seal wherein the seal is an annulus divided across its perimeter into portions.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

325, for a segmented and radially actuated (e.g., ram-type, etc.) seal for a well apparatus overpressure control device (e.g., seal for a blowout preventer, etc.).

344, for a segmented and radially actuated seal (e.g., oil saver, gas saver, etc.) for well apparatus.

356, for a dynamic seal for use in a journal box that may include a segmented seal.

493, for a segmented piston ring.

**544 Having pressure balancing or radial bias reduction feature:**

This subclass is indented under subclass 543. Segmented ring including means to equalize fluid pressure forces acting on the segmented ring or means to generate a radially outwardly directed force to oppose a radially inwardly directed bias force.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

926, for a seal for other than a dynamic, segmented ring circumferentially contacting seal for other than a piston having pressure balancing or radial bias reducing means having means to create a fluid pressure equilibrium at a joint or juncture.

SEE OR SEARCH CLASS:

384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclass 131 for a plain radial bearing where fluid moves the seal, or subclass 479 for a radial anti-friction bearing where the seal establishes a pressure or pressure responsive means loads the seal.

**545 Radial biasing spring element other than nominal garter spring:**

This subclass is indented under subclass 543. Segmented ring including means other than a nominally set forth coiled wire spring that encircles the seal around its circumference to provide a radial bias for the segmented ring.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

486, for a piston ring expander adjoining opposed ends of a split or segmented piston ring.

487, for a segmented, piston ring expander.

533, for a dynamic, segmented, circumferential contact seal for other than a piston intended to be contained or compressed by a gland member in a packing box having a particular cross-sectional shape to provide a wedging surface.

553+, for a dynamic, circumferential, contacting peripheral, radially sealing, flexible projection (e.g., a lip seal, etc.) including a bias means other than a nominal garter spring for other than a piston.

589, for a dynamic, circumferential contact seal for other than a piston radially backed by resilient or elastomeric member.

**SEE OR SEARCH CLASS:**

384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclass 150 for a plain radial bearing where mechanical means (e.g., nut, separate resilient elements, etc.) moves the seal.

**546 Particular segment end structure:**

This subclass is indented under subclass 543. Segmented ring wherein the segmented ring portions have adjoining edges that have a specific configuration.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

494+, for a piston ring having a gap and a separate bridging piece for the gap.

496+, for a single piece split piston ring having opposed asymmetrical mirrored ends.

498+, for a single piece split piston ring having other than opposed asymmetrical mirrored ends.

631, for a static contact seal for other than an internal combustion engine, or a pipe, conduit, or cable having a split including end joining structure.

**547 Interfitting projection and recess:**

This subclass is indented under subclass 546. Particular segment end structure wherein the end structure of one of the segmented ring portions has a protrusion to fit within a cavity on the end structure or another adjoining segment.

**548 Plural complementary interfitting rings:**

This subclass is indented under subclass 543. Segmented ring wherein the segmented ring has one or more adjacent rings where a portion of a peripheral surface of one the rings pene-

trates a corresponding recess on a peripheral surface of an adjoining ring.

(1) Note. This subclass does not include adjacent rings having complementary inclined or wedging surfaces.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

489+, for a piston ring having sectional structure.

529+, for a dynamic, circumferential contact seal for other than a piston intended to be contained or compressed by a gland member in a packing box having a particular cross-sectional seal shape.

**549 Peripheral radially sealing flexible projection (e.g., lip seal, etc.):**

This subclass is indented under subclass 500. Dynamic, circumferential contact seal wherein the seal is a pliant or resilient extension having a tip for relatively movable contact to an inner or outer perimeter of one of the relatively movable parts.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

309, for a process of dynamic sealing employing a peripheral radially sealing flexible projection (e.g., lip seal, piston cup, etc.).

349, for diverse and distinct dynamic seals including a close proximity seal (e.g., contactless, fluent, etc.), a relatively rotatable radially extending sealing face member (e.g., face, mechanical, etc.) and a circumferential peripheral radially sealing flexible projection (e.g., lip seal, etc.).

351, for diverse and distinct dynamic seals including a close proximity seal (e.g., contactless, fluent, etc.) and a peripheral radially sealing flexible projection (e.g., lip seal, etc.).

353, for diverse and distinct dynamic seals including a relatively rotatable radially extending sealing face member (e.g., face, mechanical, etc.) and a circumferential peripheral radially sealing flexible projection (e.g., lip seal, etc.).

- 394+, for a relatively rotatable radially extending sealing face member (e.g., face, mechanical, etc.) including a secondary mounting seal having a peripherally radially sealing flexible projection (e.g., lip seal, etc.).
- 402, for a relatively rotatable radially extending sealing face member (e.g., face, mechanical, etc.) having a flexible projection (e.g., lip seal, etc.) configuration.
- 436+, for a piston ring having a peripheral radially sealing flexible projection (e.g., a piston cup, etc.).

**SEE OR SEARCH CLASS:**

- 384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclasses 147+ for a plain radial bearing where the seal is a peripheral radially sealing flexible projection extending axially of a center of a seal seat to contact the relatively moving element to be sealed or subclasses 484+ for a radial antifriction bearing where the seal is a peripheral radially sealing flexible projection contacting a relatively rotating surface parallel to the axis of rotation.
- 464, Rotary Shafts, Gudgeons, Housings and Flexible Couplings for Rotary Shafts, subclass 131 for a drive coupling that accommodates misaligned or angularly related axes through a radially directed pin having a particular bearing cup surrounding the pin end and a flexible seal or subclass 133 for a drive coupling that accommodates misaligned or angularly related axes through a radially directed pin and a flexible seal.

**550 Made of metal or is a scraper:**

This subclass is indented under subclass 549. Peripheral radially sealing flexible projection wherein the flexible projection is metal or, dislodges or removes unwanted foreign material by direct relatively movable contact against one of the parts.

**SEE OR SEARCH CLASS:**

- 384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclass 137 for a plain radial bearing where the seal has means to remove excess lubricant from the shaft and return it to a lubricant reservoir or for removing material from the shaft about to enter the bearing from the outside.

**551 Having installation, removal, assembly, disassembly, or repair feature:**

This subclass is indented under subclass 549. Peripheral radially sealing flexible projection including means to aid in mounting, extricating, construction, dismantling or restoration of the seal.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 323, for a seal for well apparatus having an installation, removal, assembly, disassembly, or repair feature.
- 370+, for a relatively rotatable extending sealing face member (e.g., face, mechanical, etc.) having an installation, removal, assembly, disassembly, or repair feature.
- 421, for a close proximity labyrinth seal having an installation, removal, assembly, disassembly, or repair feature.
- 435, for a piston ring, piston ring expander, or seat therefore having an installation, removal, assembly, disassembly, or repair feature.
- 572+, for a dynamic circumferential contacting peripheral radially sealing flexible projection (e.g., lip seal, etc.) including a particular mounting, frame, casing, or reinforcement feature for other than a piston.
- 598, for a static contact seal for use between parts of an internal combustion engine having an installation, removal, assembly, disassembly, or repair feature.
- 609, for a static contact seal intended for insertion between an end to end pipe, conduit or cable joint having an instal-



- 630,      lation, removal, assembly, disassembly, or repair feature.  
             for a static contact seal for other than an internal combustion engine, or a pipe, conduit, or cable having an installation, removal, assembly, disassembly, or repair feature.

**SEE OR SEARCH CLASS:**

- 29,      Metal Working, for a method of mechanical manufacture or for apparatus to assemble or disassemble, subclass 402.02 for a method of repairing a seal or element thereof not provided for elsewhere, or subclasses 700+ for general apparatus to assemble or disassemble.

**552      Having pressure relief or venting feature:**

This subclass is indented under subclass 549. Peripheral radially sealing flexible projection including means for releasing or relieving fluid pressure at the joint or juncture.

- (1)      Note. For this subclass a valve for a passageway must claim or disclose a venting function.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 928,      for a seal having a pressure relief or venting feature for other than a dynamic circumferential contact seal for other than a piston having a peripheral radially sealing flexible projection including a pressure relief or venting means.

**SEE OR SEARCH CLASS:**

- 384,      Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclass 479 for a radial antifriction bearing where the seal establishes a pressure or pressure responsive means loads the seal.

**553      Bias feature other than nominal garter spring:**

This subclass is indented under subclass 549. Peripheral radially sealing flexible projection including means other than a nominally set forth coil wire spring that encircles the seal

around its circumference to provide a radial bias for the flexible projection.

- (1)      Note. Dimensional aspects of a garter spring are proper for this and indented subclasses.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 545,      for a dynamic, circumferentially contacting segmented ring for other than a piston having other than a nominal garter spring as a radial biasing spring element.  
 589,      for a dynamic, circumferential contact seal for other than a piston radially backed by resilient or elastomeric member.

**SEE OR SEARCH CLASS:**

- 384,      Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclass 148 for a plain radial bearing where the seal is a peripheral radially sealing flexible projection including bias means extending axially of a center of a seal seat to contact the relatively moving element to be sealed.

**554      Embedded spring:**

This subclass is indented under subclass 553. Bias for the flexible projection wherein the flexible projection encloses the bias feature.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 618,      for a static, contact seal intended for use on a pipe, conduit, or cable including an axially related or embedded coil spring that mounts or retains the seal.

**555      Radially extending finger spring:**

This subclass is indented under subclass 553. Bias for the flexible projection wherein the bias is one or more lengthwise projecting digits oriented along the peripheral radially sealing flexible projection.

**556 Material other than metal:**

This subclass is indented under subclass 553. Bias for the flexible projection consisting of a substance other than metal.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

468, for a particular piston ring expander separate from a piston ring and other than metal.

**557 Axially extending helical or spiral spring:**

This subclass is indented under subclass 553. Bias for the flexible projection wherein the bias feature is a wound wire formed into a tubular or conical formation about a longitudinal axis of the flexible projection.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

618, for a static contact seal intended for use on a pipe, conduit, or cable including an axially related or embedded coil spring that mounts or retains the seal.

**558 Particular fluid pressure responsive bias:**

This subclass is indented under subclass 553. Bias for the flexible projection wherein the radial bias includes specific means to react to a change in fluid pressure to vary the radial bias.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

929, for a seal for other than a dynamic circumferential contact seal for other than a piston having a fluid pressure responsive radially biasing means where a change in operation or condition induces additional leakage control.

**559 Hydrodynamic sealing feature:**

This subclass is indented under subclass 549. Peripheral, radially sealing, flexible projection including means to create a turbulence at the point of relatively movable contact between the flexible projection and the relatively movable part.

(1) Note. For this subclass, dust or dirt in a vacuum, liquid, or gas is considered a fluid.

**560 Dimensional aspect of the flexible projection (e.g., angle, length, radius, thickness, etc.):**

This subclass is indented under subclass 549. Peripheral, radially sealing, flexible projection wherein the flexible projection has at least a portion of its shape defined quantitatively (e.g., angle, length, radius, thickness, etc.).

**561 Intermediate flexible bending portion:**

This subclass is indented under subclass 549. Peripheral, radially sealing, flexible projection wherein the flexible projection has radially opposed ends and has a pliant and resilient wall structure therebetween intended to provide greater flexibility.

**562 Plural peripheral radially sealing flexible projections:**

This subclass is indented under subclass 549. Peripheral, radially sealing, flexible projection including more than one peripheral, radially sealing, flexible projection.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

612, for a static contact seal intended for insertion between an end-to-end pipe, conduit, or cable joint having plural extended projections.

SEE OR SEARCH CLASS:

384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclass 486 for a radial antifriction bearing where the seal is a peripheral, radially sealing, flexible projection contacting a relatively rotating surface parallel to the axis of rotation.

**563 Having interposed fluid receiver or director:**

This subclass is indented under subclass 562. Plural, flexible projections including means between the flexible projections to collect, contain, or guide the fluid.

**564 Having insert between the flexible projections:**

This subclass is indented under subclass 562. Plural, flexible projections including a member inset therebetween intended to bias or reinforce.

- (1) Note. Radially facing, U- or V-shaped, sealing rings are proper for this subclass.
- 565 On radial facing side of single seal:**  
This subclass is indented under subclass 562. Plural, flexible projections wherein the plural, flexible projections are on an axially extending side of the same seal body.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 615, for a static contact seal intended for use on a pipe, conduit, or cable having axially spaced projections.
- 648+, for a static contact seal for other than an internal combustion engine, or a pipe, conduit, or cable having plural projections along a sealing surface.
- 566 Both radial sides of the single seal (e.g., X-shaped, Y-shaped, etc.):**  
This subclass is indented under subclass 565. Radially facing wherein the seal body has one or more flexible projections on another axially extending side.
- 567 Radially facing U or V cross-sectional profile:**  
This subclass is indented under subclass 565. Radially facing wherein the flexible projections have a U- or V-profile in a view of a vertical plane cutting across the seal at right angles to one of its principle horizontal dimensions perpendicular to the axis of relative motion formed between the relative movable parts.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 491+, for a piston ring having a sectional structure including a component ring having a C, L, T, U, V, or Z cross-sectional profile.
- 530, for a dynamic, circumferential contact seal for other than a piston intended to be contained or compressed by a gland member in a packing box having a C, M, U, V, X, or Z cross-sectional seal shape.
- 647, for a static seal having a C-, U-, or V-shaped cross-sectional seal profile for other than an internal combustion engine, or a pipe, conduit, or cable.
- 568 Including an excluder or wiper:**  
This subclass is indented under subclass 565. Radially facing wherein the flexible projections has one or more projections to seal against dust or foreign matter.
- 569 Lining or insert:**  
This subclass is indented under subclass 549. Peripheral, radially sealing, flexible projection wherein the flexible projection includes a material layered on or inset into its surface.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 440+, for a piston ring having a surface of dissimilar material or hardness.
- 570 Made entirely of fluorocarbon material:**  
This subclass is indented under subclass 549. Peripheral, radially sealing, flexible projection wherein the flexible projection is a fluorocarbon material.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 945+, for a seal made of an elastomer or plastic containing fluorine for other than a dynamic, circumferential contact seal, for other than a piston having a peripheral, radially sealing, flexible projection made of fluorocarbon material.
- 571 Wear sleeve:**  
This subclass is indented under subclass 549. Peripheral, radially sealing, flexible projection including a tubular member mounted on one of the relatively movable parts intended to protect the one relatively movable part from deterioration caused by the relatively movable surface contact of the peripheral radially sealing flexible projection.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 527, for a dynamic, circumferential contact seal for other than a piston intended to be contained or compressed by a gland member in a packing box having a wear sleeve.

**572 Particular mounting, frame, casing or reinforcement feature:**

This subclass is indented under subclass 549. Peripheral radially sealing flexible projection including a specific structure, holding, or support means to maintain the flexible projection in relatively movable sealing contact against one of the relatively movable parts.

- (1) Note. This and indented subclasses include a nominal recitation of a casing having an additional structural feature relating the flexible projection to the casing.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 371+, for a unitized cartridge containing a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.).
- 551, for a dynamic, peripheral, radially sealing, flexible projection (e.g., lip seal, etc.) for other than a piston having an installation, removal, assembly, disassembly, or repair feature.

**573 Peripheral mounting static seal:**

This subclass is indented under subclass 572. Mounting, frame, casing, or reinforcement including a circumferential static seal between the mounting, frame, casing, or reinforcement and the part.

**574 Protrusion or bead cross-sectional profile:**

This subclass is indented under subclass 573. Peripheral mounting static seal wherein the static seal has a projection from its surface in a view of a vertical plane cutting across the static seal at right angles to one of its principle horizontal dimensions.

**575 Secured by molding or bonding:**

This subclass is indented under subclass 572. Mounting, frame, casing, or reinforcement including shaping, forming or adhering means to affix the flexible projection to the mounting, frame, casing or reinforcement.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 617, for a static contact seal mounted or retained by molding or casting into a pipe, conduit or cable.
- 922+, for a seal manufactured by bonding or joining for other than a dynamic circumferential contact seal for other than a piston having a peripheral, radially sealing, flexible projection (e.g., lip seal, etc.) secured by molding or bonding.
- 924, for a seal manufactured by deformation, material removal, or molding for other than a dynamic circumferential contact seal, for other than a piston having a peripheral, radially sealing, flexible projection (e.g., lip seal, etc.) secured by molding or bonding.

**576 Secured by clamping:**

This subclass is indented under subclass 572. Mounting, frame, casing, or reinforcement wherein the mounting, frame, casing, or reinforcement has portions of itself brought together to affix the flexible projection to the mounting, frame, casing, or reinforcement.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 922+, for a seal manufactured by bonding or joining for other than a dynamic circumferential contact seal for other than a piston having a peripheral radially sealing flexible projection (e.g., lip seal, etc.) secured by clamping.
- 924, for a seal manufactured by deformation, material removal, or molding for other than a dynamic, circumferential, contact seal for other than a piston having a peripheral, radially sealing, flexible projection (e.g., lip seal, etc.) secured by clamping.

**577 By distinct members:**

This subclass is indented under subclass 576. Secured by clamping wherein the portions are separate components brought together to make the mounting, frame, casing, or reinforcement.

**578 Having circumferentially adjustable biasing element:**

This subclass is indented under subclass 500. Dynamic, circumferential contact seal including a member extending circumferentially around the periphery of the seal and adjustable along its length to radially bias the sealing means.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

470, for a piston ring expander having means to adjust the load.

SEE OR SEARCH CLASS:

384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclass 150 for a plain, radial bearing where mechanical means (e.g., nut, separate resilient elements, etc.) moves the seal.

**579 Having floating ring or bushing (i.e., circumferentially contacting):**

This subclass is indented under subclass 500. Dynamic, circumferential, contact seal wherein the seal is an annular or tubular seal having relative movement between the relatively movable parts to oppose the flow of fluid.

- (1) Note. A floater-type seal has relative motion between the relatively movable parts it seals between, whereas a seal that accommodates gyratory or oscillatory motion is capable of sealing relatively movable parts that move angularly or perpendicularly to its main axis of motion.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

305, for a process of using a dynamic close proximity floating ring or bushing (i.e., contactless).

356, for a dynamic seal for use in a journal box that may be a floating ring or bushing.

422, for a dynamic, close proximity, floating ring or bushing (i.e., contactless).

447+, for a floating, piston ring seal.

585, for a dynamic, circumferential, contacting, elongated sleeve or bushing for other than a piston.

**580 Radially translatable in groove:**

This subclass is indented under subclass 579. Floating ring or bushing wherein the ring or bushing moves perpendicular to a rotational axis formed between the relatively movable parts and within a channel on one of the relatively movable parts.

**581 And biased:**

This subclass is indented under subclass 580. Radially translatable in a groove and a resilient member to hold or press the ring or bushing against a surface.

**582 Made of elastomer or plastic:**

This subclass is indented under subclass 579. Floating ring or bushing consisting of a resilient, rubberlike material.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

944+, for a seal made of a particular elastomeric or plastic material for other than a dynamic, circumferential, contact seal, for other than a piston having a floating ring or bushing.

**583 Inflatable seal or seal biased by inflatable member:**

This subclass is indented under subclass 500. Dynamic, circumferential, contact seal including a cavity or chamber within the seal or an associated member expanded by entry of a pressurized fluid to bias the seal or associated member against one of the relatively movable parts.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

331+, for an inflatable packer-type seal for well apparatus.

605, for a hollow, fluid-filled, or inflatable static contact seal or an associated member intended for use on a pipe, conduit, or cable.

646, for a static contact seal having a hollow or fluid-filled inflatable chamber for other than an internal combustion engine, or a pipe, conduit, or cable.

**584 Extrusion preventing (i.e., anti-extrusion) structure:**

This subclass is indented under subclass 500. Dynamic, circumferential contact seal including means deterring the seal from being squeezed out of its seated position or otherwise dislocated.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 324+, for a seal for well apparatus having an overpressure control device that may include extrusion preventing (i.e., anti-extrusion) structure.
- 611, for a static, contact seal intended for insertion between an end-to-end pipe, conduit, or cable joint having an extrusion preventing (i.e., anti-extrusion) or compression limiting feature.
- 616+, for a static, contact seal intended for use on a pipe, conduit, or cable having an associated mounting or retaining means for the seal.
- 638, for a static, contact seal for other than an internal combustion engine, or a pipe, conduit, or cable including a particular extrusion preventing (i.e., anti-extrusion) mounting or retaining means.

**585 Elongated sleeve or bushing:**

This subclass is indented under subclass 500. Dynamic circumferential contact seal wherein the seal has a somewhat elongated, tubular shape intended to guide an inner, relatively movable part.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 338, for a longitudinally actuated packing sleeve for well apparatus.
- 422, for a dynamic close proximity floating ring or bushing (i.e., contactless).
- 579+, for a dynamic, circumferential contact, floating ring or bushing seal for other than a piston.
- 607, for a sleeve-type, static, contact seal intended for a pipe, conduit, or cable.

**586 Seated in groove having stepped walls:**

This subclass is indented under subclass 500. Dynamic, circumferential, contact seal wherein the seal is in a channel having nonuniform

axial width and walls that are at a right angle to each other in one of the relatively movable parts .

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 451, for a piston groove having stepped walls.

**587 Seated in groove having oblique wall:**

This subclass is indented under subclass 500. Dynamic, circumferential, contact seal wherein the seal in a channel having a nonuniform axial width and a tapered or inclined wall in one of the relatively movable parts.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 452+, for a piston groove having an oblique wall.

**589 Radially backed by resilient or elastomeric member:**

This subclass is indented under subclass 500. Dynamic, circumferential, contact seal wherein the seal includes an elastic element to bias the sealing means in a direction perpendicular to an axis formed between the relatively movable parts.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 545, for a dynamic, circumferentially contacting, segmented ring for other than a piston having other than a nominal garter spring as a radial, biasing, spring element.
- 553+, for a dynamic, circumferential contacting, peripheral, radially sealing, flexible projection (e.g., a lip seal, etc.) including a bias means other than a nominal garter spring for other than a piston.

**590 SEAL BETWEEN FIXED PARTS OR STATIC CONTACT AGAINST RELATIVELY MOVABLE PARTS:**

This subclass is indented under the class definition. Sealing means wherein the seal is at the joint or juncture formed between stationary parts, or having a stationary sealing relationship to the relatively movable parts.

- (1) Note. Some relative movement is permissible due to such examples as expansion, contraction, slippage, or variable pressure load.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 312+, for a process of static sealing.  
345+, for a seal between relatively movable parts (i.e., a dynamic seal).

SEE OR SEARCH CLASS:

- 215, Bottles and Jars, for a cap-type bottle or jar closure, subclass 234 for a liquid seal located where the closure seats on the bottle or jar.  
220, Receptacles, for a receptacle having an access opening and a removable closure for the opening and means to seal the juncture therebetween, subclass 228 for a liquid or semi-liquid gasket.

**591 Contact seal between parts of internal combustion engine:**

This subclass is indented under subclass 590. Static seal wherein the seal's intended use between and sealingly touching against adjacent components of an internal combustion engine.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 313, for a process of static sealing between parts of an internal combustion engine.

**592 Particular coating or layer of sealing material:**

This subclass is indented under subclass 591. Intended for internal combustion engine including a film or sheet of a specific composition or configuration to form a seal against an adjacent seal member or one of the components of the internal combustion engine.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 654, for a static contact seal for other than an internal combustion engine, or a pipe, conduit, or cable having a particular sealing material or construction using plural layers.

**593 Having compression limiting feature:**

This subclass is indented under subclass 591. Intended for internal combustion engine including means to restrict seal compaction between the parts.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 611, for a static, contact seal intended for insertion between an end-to-end pipe, conduit, or cable joint having an extrusion preventing (i.e., anti-extrusion) or compression limiting feature.  
639, for a static seal for other than an internal combustion engine, or a pipe, conduit, or cable having a particular mounting or retaining means such as a compression limiting means.

**594 Particular dimensions or configuration of sealing bead or formation:**

This subclass is indented under subclass 591. Intended for internal combustion engine including an embossment or other structure having a specific size or shape for forming a seal between an adjacent sealing member or one of the components of the internal combustion engine.

**595 Metallic:**

This subclass is indented under subclass 594. Sealing bead or formation wherein the sealing bead or formation is metal.

**596 Elastomeric:**

This subclass is indented under subclass 594. Sealing bead or formation wherein the sealing bead or formation is a rubberlike material.

**597 Heat dissipating, cooling or insulating feature:**

This subclass is indented under subclass 591. Intended for internal combustion engine including means to conduct and dissipate thermal energy, or shield the seal or one of the components of the internal combustion engine from thermal energy.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 930, for a seal for other than a static seal for use between parts of an internal combustion engine including a heat

dissipation, cooling, or insulating feature having a heating or cooling feature.

**598 Having installation, removal, assembly, disassembly or repair feature:**

This subclass is indented under subclass 591. Intended for internal combustion engine including means to aid in mounting, extricating, construction, dismantling, or restoration of the seal.

SEE OR SEARCH THIS CLASS, SUBCLASS:

323, for a seal for well apparatus having an installation, removal, assembly, disassembly, or repair feature.

370+, for a relatively rotatable, extending sealing face member (e.g., face, mechanical, etc.) having an installation, removal, assembly, disassembly, or repair feature.

421, for a close proximity labyrinth seal having an installation, removal, assembly, disassembly, or repair feature.

435, for a piston ring, piston ring expander, or seat therefore having an installation, removal, assembly, disassembly, or repair feature.

551, for a dynamic, peripheral, radially sealing, flexible projection (e.g., lip seal, etc.) for other than a piston having an installation, removal, assembly, disassembly, or repair feature.

609, for a static, contact seal intended for insertion between an end-to-end pipe, conduit, or cable joint having an installation, removal, assembly, disassembly, or repair feature.

630, for a static contact seal for other than an internal combustion engine or a pipe, conduit, or cable having an installation, removal, assembly, disassembly, or repair feature.

SEE OR SEARCH CLASS:

29, Metal Working, for a method of mechanical manufacture or for apparatus to assemble or disassemble, subclass 402.02 for a method of repairing a seal or element thereof not provided for elsewhere or subclasses 700+ for

general apparatus to assemble or disassemble.

**599 Having flow restrictor:**

This subclass is indented under subclass 591. Intended for internal combustion engine including an opening for alignment to an opening for flow in the adjacent engine components where the seal opening has means to reduce or eliminate flow of fluid therethrough.

**600 Covering member or eyelet for opening:**

This subclass is indented under subclass 591. Intended for internal combustion engine including an opening and means to envelop an edge of the opening.

**601 Covering fire ring or sealing formation:**

This subclass is indented under subclass 600. Covering member or eyelet wherein the covering member or eyelet is for the opening provided for a combustion chamber of the internal combustion engine.

**602 Contact seal for a pipe, conduit, or cable:**

This subclass is indented under subclass 590. Static seal wherein the seal sealingly touches against and is intended for an extended hollow or electrically insulated conductor part to seal the joint or juncture between concentric extended hollow or electrically insulated conductor parts; the extended hollow or electrically insulated part's end, and another extended hollow or electrically insulated conductor part's end; or the extended hollow part or electrically insulated conductor and a wall.

SEE OR SEARCH THIS CLASS, SUBCLASS:

314, for a process of static sealing intended for use on a pipe, conduit, or cable.

SEE OR SEARCH CLASS:

285, Pipe Joints or Couplings, for means to secure in end-to-end or side-to-side relationship a pipe to another pipe, a plate, a wall, a receptacle, or other base where the means are independent from a seal (i.e., more than the frictional engagement of the seal secures a pipe end to another part) or a sleeve securing the pipe ends or another part; subclasses 95+ for a seal responsive to line pressure or means to test the



- seal by using line pressure, especially subclass 97 for a seal having an inflatable member having an external pressure supply; subclass 187 for temperature responsive means to maintain a good seal for expansion or contraction in the pipe coupling; or subclasses 335+ for a seal combined with the pipe joint or coupling.
- 439, Electrical Connectors, for a generic electrical connection between at least two conducting elements permitting relative motion or where the connection is a readily made or broken type, subclasses 271+ for a sealing element or material for cooperation with the coupled connector (e.g., gasket, etc.) or subclass 559 for a seal to a coupling part that extends into a panel opening.
- 603 Plural interfitting seal members for installation on the individual joined pipes, conduits, or cables:**  
This subclass is indented under subclass 602. Pipe, conduit, or cable wherein the seal comprises cooperating sealing members and at least one member is for location on each pipe, conduit, or cable of the joint or juncture.
- 604 Allows rolling or folding:**  
This subclass is indented under subclass 602. Pipe, conduit, or cable including means permitting at least a part the seal to rotate or bend completely over on itself.
- 605 Hollow, fluid filled or inflatable:**  
This subclass is indented under subclass 602. Pipe, conduit, or cable wherein the seal or an associated member has a cavity or chamber that is empty, contains a liquid or gas, or is expanded by entry of a pressurized fluid.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
331+, for an inflatable packer-type seal for well apparatus.  
583, for a dynamic, inflatable, or biased by an inflatable member circumferential contact seal for other than a piston.  
645+, for a static, contact seal for other than an internal combustion engine, or a pipe, conduit, or cable having a particular hollow or filled chamber cross-section.
- 606 And wall:**  
This subclass is indented under subclass 602. Pipe, conduit, or cable wherein the seal is for use between the pipe, conduit, or cable and the wall.
- SEE OR SEARCH CLASS:  
174, Electricity: Conductors and Insulators, for an insulator and specialized apparatus to mount, support, encase, box, or house an electrical component; subclass 65 for a box or housing structurally limited to electrical use or including an electrical device that may include a seal between a cable and the box or housing, or subclasses 152+ for a grommet to insulate a conductor as it extends through a wall or plate.
- 607 Sleeve type:**  
This subclass is indented under subclass 602. Pipe, conduit, or cable wherein the seal has a tubular or frustoconical shape.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
338, for a longitudinally actuated packing sleeve for well apparatus.  
585, for a dynamic, circumferential, contacting, elongated sleeve or bushing for other than a piston.
- 608 Inserted between end-to-end pipe, conduit, or cable joint:**  
This subclass is indented under subclass 602. Pipe, conduit, or cable wherein the seal is for use in the joint or juncture having coaxially extending opposing ends.
- 609 Having installation, removal, assembly, disassembly or repair feature:**  
This subclass is indented under subclass 608. End-to-end joint including means to aid in mounting, extricating, construction, dismantling, or restoration of the seal.

## SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 323, for a seal for well apparatus having an installation, removal, assembly, disassembly, or repair feature.
- 370+, for a relatively rotatable, extending sealing face member (e.g., face, mechanical, etc.) having an installation, removal, assembly, disassembly, or repair feature.
- 421, for a close proximity labyrinth seal having an installation, removal, assembly, disassembly, or repair feature.
- 435, for a piston ring, piston ring expander or seat therefor having an installation, removal, assembly, disassembly, or repair feature.
- 551, for a dynamic, peripheral, radially sealing, flexible projection (e.g., lip seal, etc.) for other than a piston having an installation, removal, assembly, disassembly, or repair feature.
- 598, for a static contact seal for use between parts of an internal combustion engine having an installation, removal, assembly, disassembly, or repair feature.
- 630, for a static contact seal for other than an internal combustion engine, or a pipe, conduit, or cable having an installation, removal, assembly, disassembly, or repair feature.

## SEE OR SEARCH CLASS:

- 29, Metal Working, for a method of mechanical manufacture or for apparatus to assemble or disassemble, subclass 402.02 for a method of repairing a seal or element thereof not provided for elsewhere or subclasses 700+ for general apparatus to assemble or disassemble.

**610 Spirally wound structure:**

This subclass is indented under subclass 608. End to end joint wherein the seal has a concentrically coiled arrangement.

## SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 627, for a static contact seal intended for use on a pipe, conduit or cable having a particular material or construction.
- 633, for a static contact seal for other than an internal combustion engine, or a pipe, conduit or cable having a spirally wound structure.

**611 Extrusion preventing (i.e., anti-extrusion) or compression limiting feature:**

This subclass is indented under subclass 608. End-to-end joint including means deterring the seal from being squeezed out of its seated position or otherwise dislocated, or restricting seal compaction between the parts.

- (1) Note. In this subclass the extrusion preventing (i.e., anti-extrusion) feature may work by limiting the compression of the seal or the compression limiting feature may prevent extrusion.

## SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 324+, for a seal for well apparatus having an overpressure control device that may include extrusion preventing (i.e., anti-extrusion) structure.
- 584, for a dynamic, circumferential contact seal for other than a piston having an extrusion preventing (i.e., anti-extrusion) structure.
- 593, for a static, contact seal for use between parts of an internal combustion engine having a compression limiting feature.
- 616+, for a static contact seal intended for use on a pipe, conduit or cable having an associated mounting or retaining means for the seal.
- 638, for a static, contact seal for other than an internal combustion engine, or a pipe, conduit or cable including a particular extrusion preventing (i.e., anti-extrusion) mounting or retaining means.
- 639, for a static seal for other than an internal combustion engine, or a pipe, conduit or cable including a compression limiting mounting or retaining feature.

**612 Having plural projections:**

This subclass is indented under subclass 608. End-to-end joint wherein the seal includes more than one sealing extension.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 562+, for a dynamic, circumferential contact seal for other than a piston having plural, peripheral, radially sealing, flexible projections (e.g., lip seal, etc.).
- 615, for a static contact seal intended for use on a pipe, conduit, or cable having axially spaced projections.
- 648+, for a static seal for other than an internal combustion engine, or a pipe, conduit, or cable having a particular cross-sectional profile such as plural projections along a sealing surface.

**613 Hose coupling:**

This subclass is indented under subclass 608. End-to-end joint wherein the extended hollow is flexible or flaccid .

**614 Each end has recess for the seal:**

This subclass is indented under subclass 608. End-to-end joint wherein the ends of the joint include axially facing indentations for the seal.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 625, for a static, contact seal having a particular mounting or retaining feature for and intended for use on a pipe, conduit or cable.
- 643, for static, contact seal for other than an internal combustion engine, or a pipe, conduit or cable having plural recesses on parts or seals to form a mounting or retaining groove.

**615 Having axially spaced projections:**

This subclass is indented under subclass 602. Pipe, conduit, or cable including a plurality of pliant or resilient radial extensions separated by distance along a longitudinal axis of the pipe, conduit, or cable.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 565+, for a dynamic, circumferentially contact seal for other than a piston having

plural, peripheral, radially sealing projections on a radial facing side of a single seal.

- 612, for a static, contact seal intended for insertion between an end-to-end pipe, conduit or cable joint having plural extended projections.

- 648+, for a static seal for other than an internal combustion engine or a pipe, conduit, or cable having a particular cross-sectional profile such as plural projections along a sealing surface.

**616 Having associated mounting or retaining feature:**

This subclass is indented under subclass 602. Pipe, conduit, or cable including related fastening or securing means for the seal.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 324+, for a seal for well apparatus having an overpressure control device that may include extrusion preventing (i.e., anti-extrusion) structure.
- 584, for a dynamic, circumferential contact seal for other than a piston having an extrusion preventing (i.e., anti-extrusion) structure.
- 611, for a static, contact seal intended for insertion between an end-to-end pipe, conduit, or cable joint having an extrusion preventing (i.e., anti-extrusion) or compression limiting feature.
- 637+, for a static, contact seal for other than an internal combustion engine or a pipe, conduit, or cable having a particular associated mounting or retaining means.

**617 Molded or cast into the pipe, conduit, or cable:**

This subclass is indented under subclass 616. Mounting or retaining feature wherein the pipe, conduit, or cable has the seal built into it.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 575, for a dynamic, circumferential, contacting, peripheral, radially sealing, flexible projection (e.g., lip seal, etc.) molded or bonded to a mounting, frame, casing, or reinforcement for other than a piston.

- 924, for a seal manufactured by deformation, material removal, or molding for other than a static pipe, conduit, or cable.

**SEE OR SEARCH CLASS:**

- 264, Plastic and Nonmetallic Article Shaping or Treating: Processes, subclasses 259+ for a composite article created by shaping or forming molding material against and uniting to a preform.
- 425, Plastic Article Shaping or Earthenware Shaping or Treating: Apparatus, a generic class for apparatus not provided for elsewhere to mold a plastic, shape molten materials where no molding surface is employed, treating a product made by the apparatus of this class, randomly deposit and bond particulate material, or a combination of apparatus of this class with any diverse working or treating apparatus, Digest 47 for a seal ring.

**618 Axially related or embedded coil spring:**

This subclass is indented under subclass 616. Mounting or retaining feature wherein the mounting or retaining feature is a helically wound annular spring coaxial to or encapsulated by the seal.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 554, for a dynamic, circumferential contact seal for other than a piston having a peripheral radially sealing projection biased by an embedded spring.
- 557, for a dynamic, circumferential contact seal for other than a piston having a peripheral radially sealing projection biased by an axially extending helical or spiral spring.
- 627, for a static, contact seal intended for use on a pipe, conduit, or cable having a particular material or construction.

**619 Axially related backing ring:**

This subclass is indented under subclass 616. Mounting or retaining feature wherein the mounting or retaining feature has an annular shape coaxial to the seal providing support.

**620 Clamping gland:**

This subclass is indented under subclass 619. Axially related backing ring including axially acting means to force the seal into a joint or juncture formed between the pipe, conduit, or cable.

- (1) Note. A biasing spring is not a gland or follower.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 329+, for a seal for well apparatus where the seal is in a packing box contained or compressed by a gland member.
- 510+, for a dynamic circumferential contact seal for other than a piston intended to be contained or compressed by a gland member in a packing box.

**621 Particular axially acting feature:**

This subclass is indented under subclass 620. Clamping gland wherein the gland has a specific means to move the gland along the axis.

- (1) Note. In this subclass and indented subclass the particular axially acting feature is intended to be more than a "bolted flange or gland".

**622 Threaded gland:**

This subclass is indented under subclass 621. Particular, axially acting feature wherein the gland has a helical rib to move the gland along the axis.

**623 Particular gland shape:**

This subclass is indented under subclass 620. Clamping gland wherein the gland has a specific form.

- (1) Note. For this subclass a "segmented gland" must have a particular joining structure for the segments.

**624 And seal secure together:**

This subclass is indented under subclass 619. Axially related backing ring and the seal fasten to each other.

**625 Particular and located on the pipe, conduit or cable:**

This subclass is indented under subclass 616. Mounting or retaining feature wherein the extended hollow or electrically insulated conductor part has a specific means to mount or retain the seal.

SEE OR SEARCH THIS CLASS, SUBCLASS:

614, for a static, contact seal intended for insertion between an end-to-end pipe, conduit, or cable joint where each end has a recess for the seal.

**626 Particular seal shape:**

This subclass is indented under subclass 602. Pipe, conduit, or cable wherein the seal has a specific form.

SEE OR SEARCH THIS CLASS, SUBCLASS:

325, for a segmented and radially actuated (e.g., ram-type, etc.) seal for a well apparatus overpressure control device (e.g., seal for a blowout preventer, etc.).

344, for a segmented and radially actuated seal (e.g., oil saver, gas saver, etc.) for well apparatus.

335, for a seal for well apparatus having an axially facing cup shape.

605, for a hollow, fluid-filled, or inflatable static contact seal or an associated member intended for use on a pipe, conduit, or cable.

644+, for a static, contact seal for other than an internal combustion engine, or a pipe, conduit or cable having a particular cross-sectional seal profile

**627 Particular seal material or construction:**

This subclass is indented under subclass 602. Pipe, conduit, or cable wherein the seal is of a specific material or has a specific arrangement of material.

SEE OR SEARCH THIS CLASS, SUBCLASS:

534+, for a dynamic, circumferential contact seal for other than a piston intended to be contained or compressed by a gland member in a packing box hav-

ing a particular material or construction.

610, for a static, contact seal intended for insertion between an end to end pipe, conduit or cable joint having a spirally wound structure.

618, for a static, contact seal intended for use on a pipe, conduit or cable including an axially related or embedded coil spring that mounts or retains the seal.

611, for a static, contact seal intended for insertion between an end to end pipe, conduit or cable joint having an extrusion preventing (i.e., anti-extrusion) or compression limiting feature.

650+, for a static, contact seal for other than an internal combustion engine or a pipe, conduit, or cable having a particular sealing material or construction.

935+, for a seal for other than a static contact seal for a pipe, conduit, or cable made out of a particular material.

**628 Contact seal for other than internal combustion engine, or pipe, conduit or cable:**

This subclass is indented under subclass 590. Static seal wherein the seal's intended use is to sealingly touches against a part that is other than an internal combustion engine, extended hollow or electrically insulated conductor.

SEE OR SEARCH CLASS:

49, Movable or Removable Closures, for more than nominal movable or removable closure structure (e.g., door jam, etc.); subclasses 475.1+ for a seal acting at a juncture of the closure and an adjacent member.

52, Static Structures (e.g., Buildings), for a site erected structure or related components (e.g., panels, beams, columns, etc.), subclasses 140+ for a burial vault having a separately placeable closure in abutting relation to wall edges and sealing material retaining construction, subclasses 393+ for a relatively yieldable preformed separator (i.e., expansion joint), or subclasses 408+ for a disparate sheet lamina between exposed surfaces of wall, floor, or roof (e.g., vapor barrier, waterproofing membrane, etc.).

- 114, Ships, for marine vehicles and accessories not otherwise classifiable, subclass 93 that may have a seal for a joint between a mast and a deck.
- 210, Liquid Purification or Separation, subclass 450 for a filter in a flow line or a flow line connected closed casing having a gasket between the filter and walls of the casing (e.g., oil filter gasket, etc.).
- 215, Bottles and Jars, for a cap-type bottle or jar closure, subclass 45 for neck structure to receive a particular closure including a seal or subclasses 341+ for a cap-type closure having an identifiable, integral or separate seal or liner.
- 220, Receptacles, for a receptacle having an access opening and a removable closure for the opening and means to seal the juncture therebetween, subclass 378 for a gasket or packing.
- 222, Dispensing, subclass 542 for a seal provided for a joint, closure, or flow controller of a dispenser.
- 251, Valves And Valve Actuation, for means to close or restrict a flow of fluid through a passage by a definite predetermined motion of the means combined with a seal, subclass 257 for a valve actuated by a cam encased in a valve body having a seal, subclasses 306+ for a rotary butterfly valve having a seal carried by the valve or a valve seat, subclasses 314+ for a rotary valve and a seat therefor or a seal between the rotary valve and the seat, or subclass 318 for a reciprocating valve having a seal made of nonresilient material on a reciprocating head element or seat made of a resilient material.
- 296, Land Vehicles: Bodies and Tops, for a body secured to the running gear and a top therefor, subclass 93 for weatherstripping to seal between panels or between a windshield and the body or top.
- 376, Induced Nuclear Reactions: Processes, Systems, and Elements, subclasses 203+ for a seal at a joint or juncture between and combined with fluid confining structures (e.g., a nozzle, a vessel cover, etc.) of a nuclear reactor pressure vessel.
- 405, Hydraulic and Earth Engineering, subclass 152 for method or apparatus to form an underground passageway (e.g., tunnel, etc.) lined by panels having a seal between adjacent panels.
- 445, Electric Lamp or Space Discharge Component or Device Manufacturing, subclass 25 for a process of display or gas panel making including a seal not elsewhere classified.
- 629 Magnetic:**  
This subclass is indented under subclass 628. Contact seal for other than wherein the seal has a polar field.
- SEE OR SEARCH THIS CLASS, SUBCLASS:**
- 378, for a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.) including a magnetic axial bias therefor.
- 410, for a dynamic, close proximity seal that uses magnetism to affect fluid flow.
- 501, for a dynamic, circumferential contact seal for other than a piston and a magnetic means to bias the seal.
- SEE OR SEARCH CLASS:**
- 49, Movable or Removable Closures, for more than nominal movable or removable closure structure (e.g., door jam, etc.), subclass 478.1 for a seal acting at a juncture of the closure and an adjacent member having a magnetic feature.
- 252, Compositions, subclasses 62.51+ for a composition useful for a magnetic purpose or a process for making the composition, not provided for elsewhere.
- 335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets; subclasses 209+ for a magnet or an electromagnet, configured or arranged to perform external mechanical work but does not include the external mechanical work.

**630 Having installation, removal, assembly, disassembly, or repair feature:**

This subclass is indented under subclass 628. Contact seal for other than including means to aid in mounting, extricating, construction, dismantling or restoration of the seal.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 323, for a seal for well apparatus having an installation, removal, assembly, disassembly, or repair feature.
- 370+, for a relatively rotatable, extending, sealing face member (e.g., face, mechanical, etc.) having an installation, removal, assembly, disassembly or repair feature.
- 435, for a piston ring, piston ring expander, or seat therefore having an installation, removal, assembly, disassembly, or repair feature.
- 551, for a dynamic, peripheral, radially sealing, flexible projection (e.g., lip seal, etc.) for other than a piston having an installation, removal, assembly, disassembly, or repair feature.
- 598, for a static, contact seal for use between parts of an internal combustion engine having an installation, removal, assembly, disassembly or repair feature.
- 609, for a static, contact seal intended for insertion between an end-to-end pipe, conduit, or cable joint having an installation, removal, assembly, disassembly, or repair feature.

**SEE OR SEARCH CLASS:**

- 29, Metal Working, for a method of mechanical manufacture or for apparatus to assemble or disassemble, subclass 402.02 for a method of repairing a seal or element thereof not provided for elsewhere or subclasses 700+ for general apparatus to assemble or disassemble.
- 49, Movable or Removable Closures, for more than nominal movable or removable closure structure (e.g., door jam, etc.), subclass 482.1 for a seal acting at a juncture of the closure and an adjacent member having a seg-

menting, replacing, adjusting, or severing feature.

- 413, Sheet Metal Container Making, for a process or apparatus for performing an attendant operation before final assembly of a lid to a receptacle, subclass 34 for apparatus to seam together the receptacle and lid using a roller die including means to apply a gasket or seal therebetween before they are or subclasses 58+ for apparatus to form lid having means to apply seal or liner.

**631 Split including end joining structure:**

This subclass is indented under subclass 628. Contact seal for other than wherein the seal structure has a gap and uniting means to connect edges created by the gap.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 494+, for a piston ring having a gap and a separate bridging piece for the gap.
- 496+, for a single piece split piston ring having opposed asymmetrical mirrored ends.
- 498+, for a piston ring where a single piece split annulus has substantially opposed dissimilar ends.
- 546+, for a dynamic, segmented ring circumferentially contacting seal for other than a piston having a particular end structure.

**632 Segmented periphery:**

This subclass is indented under subclass 628. Contact seal for other than wherein the seal's perimeter is divided into portions.

**633 Spirally wound structure:**

This subclass is indented under subclass 628. Contact seal for other than wherein the seal has a concentrically coiled arrangement.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 610, for a static contact seal intended for insertion between an end-to-end pipe, conduit, or cable joint having a spirally wound structure.

**634 Flexible sleeve, boot, or diaphragm:**

This subclass is indented under subclass 628. Contact seal for other than wherein the seal has a flexible wall member to accommodate relatively movable parts allowing static contact sealing against the parts.

**SEE OR SEARCH THIS CLASS, SUB-CLASS:**

- 315, for a process of static sealing employing a flexible sleeve, boot, or diaphragm.
- 389, for a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.) including fluid pressure acting against a bellows or diaphragm to create an axial bias therefor.
- 391+, for a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.) including a flexible sleeve, boot, or diaphragm to provide a secondary seal or driving connection therefor.
- 504, for a dynamic, circumferential contact seal for other than a piston that accommodates gyratory or oscillatory motion by using a flexible connection having static contact between the seal and one of the relatively movable parts.

**SEE OR SEARCH CLASS:**

- 74, Machine Elements and Mechanisms, subclasses 18+ for a flexible sealing material attached to a casing and a moving rod, and a device or mechanism to move the rod.
- 100, Presses, subclass 269.21 for a seal or gasket around a piston for a fluid actuated reciprocating press.
- 188, Brakes, for means of retarding motion of or stopping of machines; subclasses 73.44+ or an axially extending pin to retain an actuator axially slidable in a plane parallel to an axis of a rotating wheel that usually includes a seal.
- 251, Valves and Valve Actuation, for means to close or restrict a flow of fluid through a passage by a definite

predetermined motion of the means combined with a seal, subclasses 335.1+, for a flexible wall seal between an actuator and valve.

- 403, Joints and Connections, for a joint or connection structure that goes beyond providing an environment for a seal; subclasses 50+ for a flexible diaphragm or bellows secured to each part.
- 464, Rotary Shafts, Gudgeons, Housings, and Flexible Couplings for Rotary Shafts, subclasses 173+ for a flexible boot for a joint to transmit rotary torque.

**635 Dome-, cup-, or bell-shaped, or for ball joint:**

This subclass is indented under subclass 634. Flexible sleeve, boot, or diaphragm wherein the seal has an open containerlike shape or form (e.g., C, U, V, etc.) to enclose the joint or is for a spherical part of the joint.

**SEE OR SEARCH CLASS:**

- 403, Joints and Connections, for a joint or connection structure that goes beyond providing an environment for a seal; subclass 134 for a ball and socket having an external seal (i.e., remote from the bearing surface).

**636 Tubular or frustoconical shape having corrugated wall portion:**

This subclass is indented under subclass 634. Flexible sleeve, boot, or diaphragm wherein the seal is an elongated enclosing flexible wall having a portion including alternate furrows and ridges (e.g., pleated, etc.).

**637 Having particular associated mounting or retaining feature:**

This subclass is indented under subclass 628. Contact seal for other than including a specific related fastening or securing means for the seal.

**SEE OR SEARCH THIS CLASS, SUB-CLASS:**

- 616+, for a static, contact seal intended for use on a pipe, conduit, or cable having an associated mounting or retaining means for the seal.



## SEE OR SEARCH CLASS:

251, Valves and Valve Actuation, for means to close or restrict a flow of fluid through a passage by a definite predetermined motion of the means combined with a seal, subclass 171 for a gland member pressing a seal constituting a valve seat against a valve head, subclass 189 for separate actuators or different functions of the same actuator to increase contact pressure between piston type valves provided with expansible sealing and a seat, subclass 191 for means to increase the contact pressure between a piston-type valve having a seal that expands upon closing and a seat, or subclass 363 for a removable valve seat having a seal between the valve seat and its supporting structure.

**638 Extrusion preventing (i.e., anti-extrusion) structure:**

This subclass is indented under subclass 637. Mounting or retaining feature including means deterring the seal from being squeezed out of its seated position or otherwise dislocated.

## SEE OR SEARCH THIS CLASS, SUB-CLASS:

324+, for a seal for well apparatus having an overpressure control device that may include extrusion preventing (i.e., anti-extrusion) structure.

584, for a dynamic, circumferential contact seal for other than a piston having an extrusion preventing (i.e., anti-extrusion) structure.

611, for a static contact seal intended for insertion between an end-to-end pipe, conduit, or cable joint having an extrusion preventing (i.e., anti-extrusion) or compression limiting feature.

619+, for a static, contact seal intended for use on a pipe, conduit or cable including an axially related backing ring to mount or retain the seal.

**639 Compression limiting feature:**

This subclass is indented under subclass 637. Mounting or retaining feature including means restricting seal compaction between the parts.

## SEE OR SEARCH THIS CLASS, SUB-CLASS:

593, for a static, contact seal for use between parts of an internal combustion engine having a compression limiting feature.

611, for a static, contact seal intended for insertion between an end-to-end pipe, conduit, or cable joint having an extrusion preventing (i.e., anti-extrusion) or compression limiting feature.

**640 Anchoring feature extending through seal:**

This subclass is indented under subclass 637. Mounting or retaining feature including a fastening or securing means projecting through the seal to firmly affix the seal to one of the parts.

## SEE OR SEARCH CLASS:

411, Expanded, Threaded, Driven, Headed, Tool-Deformed, or Locked-Threaded Fastener, for a fastener suited for general use, subclasses 369+ for a headed, threaded, fastening means and nut having a washer and seal, or subclass 542 for a washer configured for a fastener having a seal.

**641 Groove structure on the seal or part:**

This subclass is indented under subclass 637. Mounting or retaining feature wherein the mounting or retaining means is an indentation on the seal or part.

## SEE OR SEARCH THIS CLASS, SUB-CLASS:

625, for a static, contact seal having a particular mounting or retaining feature for and intended for use on a pipe, conduit, or cable.

## SEE OR SEARCH CLASS:

49, Movable or Removable Closures, for more than nominal movable or removable closure structure (e.g., door jam, etc.), subclass 483.1 for a seal acting at a juncture of the closure and an adjacent member having complementary engaging portions on closure or closure and portal frame.

**642 Channel shaped:**

This subclass is indented under subclass 641. Groove structure wherein the groove has a generally U-shaped cross-section.

**SEE OR SEARCH CLASS:**

49, Movable or Removable Closures, for more than nominal movable or removable closure structure (e.g., door jam, etc.) for a seal acting at a juncture of the closure and an adjacent member, subclass 489.1 anchored in channel or slot in closure or portal frame or subclass 490.1 having a U-shaped member or portion to mount the seal.

**643 Single seat formed by plural recesses:**

This subclass is indented under subclass 641. Groove structure wherein the parts or seals have indentations to form the mounting or retaining groove when assembled.

**SEE OR SEARCH THIS CLASS, SUB-CLASS:**

614, for a static contact seal intended for insertion between an end to end pipe, conduit or cable joint where each end has a recess for the seal.

**644 Particular cross-sectional seal profile:**

This subclass is indented under subclass 628. Contact seal for other than wherein the seal has a specific shape in a view of a vertical plane cutting across the seal at right angles to one of its principal horizontal dimensions.

**SEE OR SEARCH CLASS:**

626, for a static, contact seal having a particular seal shape intended for use on a pipe, conduit, or cable.

**645 Hollow or filled chamber:**

This subclass is indented under subclass 644. Particular cross-sectional seal profile wherein the seal has a cavity empty or full of material.

**SEE OR SEARCH THIS CLASS, SUB-CLASS:**

605, for a hollow, fluid-filled, or inflatable static contact seal or an associated member intended for use on a pipe, conduit, or cable.

**SEE OR SEARCH CLASS:**

49, Movable or Removable Closures, for more than nominal movable or removable closure structure (e.g., door jam, etc.), subclass 498.1 for a seal acting at a juncture of the closure and an adjacent member is tubular or has a tubular portion.

**646 Inflatable:**

This subclass is indented under subclass 645. Such as a hollow or filled chamber wherein the chamber has pressurized fluid introduced to expand the seal.

**SEE OR SEARCH THIS CLASS, SUB-CLASS:**

331+, for an inflatable packer-type seal for well apparatus.  
583, for a dynamic inflatable or biased by an inflatable member circumferential contact seal for other than a piston.

**SEE OR SEARCH CLASS:**

49, Movable or Removable Closures, for more than nominal movable or removable closure structure (e.g., door jam, etc.), subclass 477.1 for a seal acting at a juncture of the closure and an adjacent member having an inflatable or fluid pressure responsive feature.

**647 C-, U-, or V-shaped:**

This subclass is indented under subclass 644. Particular cross-sectional seal profile wherein the seal has a C-, U-, or V-form in a view of a vertical plane cutting across the seal at right angles to one of its principle horizontal dimensions.

**SEE OR SEARCH THIS CLASS, SUB-CLASS:**

395, for a relatively rotatable radially extending sealing face member (e.g., face, mechanical, etc.) including a secondary mounting seal having U- or V-shaped, peripherally, radially sealing, flexible projections (e.g., lip seal, etc.).  
530, for a dynamic, circumferential contact seal for other than a piston intended to be contained or compressed by a

- gland member in a packing box having a C, M, U-, V, X, or Z cross-sectional seal shape.
- 567, for a dynamic, circumferential contact seal for other than a piston having peripherally, radially sealing, flexible projections forming a radially facing U or V cross-sectional profile.
- 648 Plural projections along sealing surface:**  
This subclass is indented under subclass 644. Particular cross-sectional seal profile wherein the seal has more than one sealing extension along a side of the seal facing the part.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 565+, for a dynamic, circumferentially contact seal for other than a piston having plural, peripheral, radially sealing projections on a radial facing side of a single seal.
- 612, for a static, contact seal intended for insertion between an end-to-end pipe, conduit, or cable joint having plural extended projections.
- 615, for a static, contact seal intended for use on a pipe, conduit, or cable having axially spaced projections.
- 649 Plural projections along opposite sealing surfaces:**  
This subclass is indented under subclass 648. Plural projections along a sealing surface including plural projections along an adverse sealing surface.
- 650 Particular sealing material or construction:**  
This subclass is indented under subclass 628. Contact seal for other than wherein the seal is of a specific material or has a specific arrangement of material.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 534+, for a dynamic, circumferential contact seal for other than a piston intended to be contained or compressed by a gland member in a packing box having a particular material or construction.
- 627, for a static, contact seal intended for use on a pipe, conduit, or cable having a particular material or construction.
- 935+, for a seal for other than a static contact seal for an internal combustion engine, pipe, conduit or cable made out of a particular material.
- SEE OR SEARCH CLASS:
- 215, Bottles and Jars, for a cap type bottle or jar closure, subclass 233 for a hardenable liquid or plastic seal where the closure seats on the bottle or jar.
- 651 Embedded reinforcement:**  
This subclass is indented under subclass 650. Particular sealing material or construction wherein the seal envelops a means to strengthen the seal.
- 652 Distinct sheath or covering:**  
This subclass is indented under subclass 650. Particular sealing material or construction wherein the seal has a distinct casing or layer surrounding at least a major portion of an outer periphery of the seal.
- 653 Metal:**  
This subclass is indented under subclass 652. Distinct sheath or covering wherein the sheath or covering is metal.
- 654 Plural layers:**  
This subclass is indented under subclass 650. Particular sealing material or construction wherein the seal has more than one ply of material.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 592, for a static, contact seal intended for use between parts of an internal combustion engine having a particular coating or layer of sealing material.

#### CROSS-REFERENCE ART COLLECTIONS

The following collections have their patents placed without regard to their original classification or to their claimed subject matter. These collections, therefore, are only examples of the art encompassed by the definition and a thorough search for a desired concept should include a search in the proceeding subclasses. Do not place originals in cross-reference art collections.

**902 SEAL FOR STERLING ENGINE:**

This subclass is indented under the class definition. Sealing means intended to seal a joint or juncture of a sterling engine.

**903 SEAL FOR ROTATING KILN OR DRUM:**

This subclass is indented under the class definition. Sealing means intended to seal a joint or juncture between a static part and a relatively rotating hollow cylindrical heated container.

**SEE OR SEARCH CLASS:**

34, Drying and Gas or Vapor Contact With Solids, for apparatus to separate liquids from solids (i.e., drying) or contacting solids with gases or vapors, subclass 601 that may have a seal between a rotating drum or receptacle, and a housing.

432, Heating, subclass 115 for a rotary drum mounted for rotation about a horizontal or slightly inclined axis, the rotation of the rotary drum imparting a tumbling motion to material placed therein, forming a juncture against a stationary part with a flexible seal, cooler seal, or an air curtain-type flow controller therebetween to prevent escape of the rotary drum's atmosphere.

**904 VISCOUS SEAL:**

This subclass is indented under the class definition. Sealing means wherein the sealing means is a material having a ropy or glutinous consistency (e.g., lacking in easy movement or fluidity, etc.) and having the quality of sticking or adhering to oppose the flow of fluid at the joint or juncture.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

301+, for a process of dynamic close proximity sealing (e.g., contactless, fluent, etc.).

347+, for diverse and distinct dynamic seals including a close proximity seal.

409+, for a dynamic, close proximity seal (e.g., contactless, fluent, etc.).

**905 T-SHAPED OR I-SHAPED RING MEMBER INCLUDING SEAL ON A SIDE:**

This subclass is indented under the class definition. Sealing means comprising an annular component of T- or I-shaped cross-section having sealing means on either or both sides of the annular component's central periphery.

**906 SEAL FOR ARTICLE OF INDEFINITE LENGTH (E.G., STRIP, SHEET, ETC.):**

This subclass is indented under the class definition. Sealing means comprising sealing means for use on an article of indeterminate extent.

**SEE OR SEARCH CLASS:**

432, Heating, subclass 244 for a heating device specialized to feed or discharge a work chamber including a seal at the chamber's wall for conveyor arm or shaft.

**907 PASSAGEWAY IN ROD OR SHAFT:**

This subclass is indented under the class definition. Sealing means including a pathway for a fluid in a part (e.g., rod, shaft) relatively movable to and surrounded by another part (e.g., housing, casing, etc.).

**SEE OR SEARCH CLASS:**

305, Wheel Substitutes for Land Vehicles, subclasses 100+ for a passageway in a connecting pin for lubrication.

**908 SEAL FOR USE IN ROTATING AND RECIPROCATING ARRANGEMENT:**

This subclass is indented under the class definition. Sealing means comprising sealing means between relatively movable parts that rotate and reciprocate.

**909 SIMILAR SEALING STRUCTURES FOR MOUNTING ON PISTON AND ABOUT ROD:**

This subclass is indented under the class definition. Sealing means comprising sealing means providing the same basic sealing structure for use in different embodiments such as (1) on a part (i.e., a piston) that reciprocates along an axis of an enclosing wall and, (2) on either the enclosing wall surrounding a reciprocating part (e.g., rod, etc.) or the part (i.e., a piston).

**910 O-RING SEAL:**

This subclass is indented under the class definition. Sealing means comprising a seal circular in plan view but may be of any geometric shape in a view of a vertical plane cutting across the seal at right angles to one of its principal horizontal dimensions.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

382, for a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.) using an O-ring shaped axial biasing spring made of elastomeric material.

**SEE OR SEARCH CLASS:**

384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclass 152 for a plain radial bearing where the seal is in the shape of an O-ring on the outer area of the bearing or shaft and made out of a resilient material or subclass 489 for a radial antifriction bearing where the seal is a resilient O-ring seal.

**911 SEAL COMBINED WITH NOMINAL MOTION TRANSMITTING DEVICE:**

This subclass is indented under the class definition. Sealing means combined with a movement relay setting forth only so much structure foreign to the class to define the operating environment of the seal means.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

390+, for a relatively rotatable radially extending sealing face member (e.g., face, mechanical, etc.) including a secondary mounting seal or driving connection therefor.

634+, for a static, contact, flexible sleeve, boot, or diaphragm seal for other than an internal combustion engine or a pipe, conduit, or cable.

**SEE OR SEARCH CLASS:**

403, Joints and Connections, for a joint or connection structure that goes beyond providing an environment for a seal; subclass 288 for a seal distinct from the joint and unnecessary to the connection of parts.

**912 Spline connection:**

This subclass is indented under subclass 911. Nominal motion transmitting device wherein the device is a series of spaced ridges parallel to a longitudinal axis of one of the parts (e.g., rod, shaft, etc.) that fits into a corresponding hole in the other part.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

354, for a dynamic seal for a helically threaded part.

**913 SEAL FOR FLUID PRESSURE BELOW ATMOSPHERIC (E.G., VACUUM, ETC.):**

This subclass is indented under the class definition. Sealing means intended to maintain a sealed fluid at a pressure lower than air pressure from its surrounding environment.

**914 BACKUP SEAL FOR FAILURE OF PRIMARY SEAL:**

This subclass is indented under the class definition. Sealing means comprising a main and secondary sealing means whereby the secondary sealing means acts as an auxiliary seal upon the breakdown of the main sealing means.

(1) Note. The fluid pressure typically forces the auxiliary seal into operation.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

929, for a seal where a change in operation or condition induces additional leakage control.

**915 SEAL INCLUDING COMPRESSION SET FEATURE:**

This subclass is indented under the class definition. Sealing means comprising a seal material having a specific property defined by the measurement of permanent deformation remaining after releasing the material from a compressive load as an index to creep or stress relaxation.

**916 SEAL INCLUDING VIBRATION DAMPENING FEATURE:**

This subclass is indented under the class definition. Sealing means including means to reduce or eliminate oscillatory or gyratory effects.

**917 SEAL INCLUDING FRANGIBLE FEATURE:**

This subclass is indented under the class definition. Sealing means including means allowing breaking or tearing of the seal.

**SEE OR SEARCH CLASS:**

413, Sheet Metal Container Making, for a process or apparatus for performing an attendant operation before final assembly of a lid to a receptacle; subclasses 12+ for a process of fabricating a frangible end closure or assembling a frangible part to an end closure or subclasses 67+ for apparatus to form lid having means to form frangible zone in lid.

**918 SEAL COMBINED WITH FILTER OR FLUID SEPARATOR:**

This subclass is indented under the class definition. Sealing means combined with means to remove foreign material from a fluid or separate distinct fluids.

**SEE OR SEARCH CLASS:**

210, Liquid Purification or Separation, subclass 450 for a filter in a flow line or a flow line connected closed casing having a gasket between the filter and walls of the casing (e.g., oil filter gasket, etc.).

**919 SEAL INCLUDING ELECTRICAL FEATURE:**

This subclass is indented under the class definition. Sealing means including an ability to conduct or resist a flow of electricity.

**SEE OR SEARCH CLASS:**

174, Electricity: Conductors and Insulators, for an insulator and specialized apparatus to mount, support, encase, box or house an electrical component; subclass 65 for a box or housing structurally limited to electrical use or including an electrical device, that

may include a seal between a cable and the box or housing, or subclasses 152+ for a grommet to insulate a conductor as it extends through a wall or plate.

439, Electrical Connectors, for a generic electrical connection between at least two conducting elements permitting relative motion or where the connection is a readily made or broken type, subclass 927 for a conductive gasket.

**920 SEAL INCLUDING ELECTROMAGNETIC SHIELDING FEATURE:**

This subclass is indented under the class definition. Sealing means including an ability to protect against electrical and magnetic radiation.

**SEE OR SEARCH CLASS:**

174, Electricity: Conductors and Insulators; for an insulator and specialized apparatus to mount, support, encase, box, or house an electrical component; subclass 35 for an electromagnetic shield or anti-inductive device that may be a gasket.

439, Electrical Connectors, for a generic electrical connection between at least two conducting elements permitting relative motion or where the connection is a readily made or broken type, subclass 89 for a seal to a connector having inductive shielding or arc suppressing means including an elastomeric or nonmetallic conductive portion.

**921 CLOSURE OR WEATHER STRIP SEAL:**

This subclass is indented under the class definition. Sealing means wherein the seal is a narrow piece intended for use at the juncture between an obstructive structure and a passageway, or to close or reduce a gap formed at the juncture to prevent or reduce the flow of ambient air or moisture therethrough.

**SEE OR SEARCH CLASS:**

49, Movable or Removable Closures, for more than nominal movable or removable closure structure (e.g., door jam, etc.); subclasses 475.1+ for a seal acting at a juncture of the closure and an adjacent member.

- 296, Land Vehicles: Bodies and Tops, for a body secured to the running gear and a top therefor, subclass 93 for weatherstripping to seal between panels or between a windshield and the body or top.

**922 BONDING OR JOINING FOR MANUFACTURE OF SEAL:**

This subclass is indented under the class definition. Sealing means comprising a seal constructed by binding or uniting components of the seal.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 575, for a dynamic, circumferential, contacting, peripheral, radially sealing, flexible projection (e.g., lip seal, etc.) molded or bonded to a mounting, frame, casing, or reinforcement for other than a piston.
- 576+, for a dynamic circumferential contacting peripheral radially sealing flexible projection (e.g., lip seal, etc.) secured by clamping to a mounting, frame, casing or reinforcement for other than a piston.

SEE OR SEARCH CLASS:

- 29, Metal Working, for a method of mechanical manufacture, subclasses 888.07+ for a method of piston ring or packing manufacture or subclass 888.3 for a method of seal or packing manufacture.
- 156, Adhesive Bonding and Miscellaneous Chemical Manufacture, subclasses 60+ for a process of manufacturing an article involving surface bonding or assembly therefor or subclasses 349+ for an apparatus to manufacture an article involving surface bonding or assembly therefor.
- 228, Metal Fusion Bonding; in general, for apparatus or methods of joining the meeting faces of juxtaposed or engaged metal articles, of the same article originally in a form sustaining state, or a metal article to a nonmetal article, by direct application of heat or mechanical energy to the articles causing a flowing or blending of the meeting faces or causing a filler to

flow or blend together with the meeting faces to form a continuous inter-connecting zone.

- 413, Sheet Metal Container Making, for a process or apparatus for performing an attendant operation before final assembly of a lid to a receptacle; subclass 7 for a process of applying a sealant to an end joint between the lid and the receptacle, subclass 9 for a process of joining a preformed gasket or liner to the lid, or subclasses 58+ for apparatus to form lid having means to apply seal or liner.

**923 Shrink fitting for the assembly of seal:**

This subclass is indented under subclass 922. Bonding or joining for manufacture of seal wherein the seal components are bonded or joined by subjecting one or more of the components to a temperature variation of such a magnitude as to change a dimension of at least one of the components allowing them to be easily put together, afterwards when the temperature returns to normal the components held together by an interference fit.

**924 DEFORMATION, MATERIAL REMOVAL OR MOLDING FOR MANUFACTURE OF SEAL:**

This subclass is indented under the class definition. Sealing means comprising a seal made from a fluent or solid material formed into a particular shape.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 575, for a dynamic circumferential contacting peripheral radially sealing flexible projection (e.g., lip seal, etc.) molded or bonded to a mounting, frame, casing or reinforcement for other than a piston.
- 576+, for a dynamic, circumferential contacting peripheral radially sealing flexible projection (e.g., lip seal, etc.) secured by clamping to a mounting, frame, casing or reinforcement for other than a piston.
- 617, for a static, contact seal mounted or retained by molding or casting into a pipe, conduit or cable.

## SEE OR SEARCH CLASS:

29, Metal Working, for a method of mechanical manufacture, subclasses 888.07+ for a method of piston ring or packing manufacture or subclass 888.3 for a method of seal or packing manufacture.

264, Plastic and Nonmetallic Article Shaping or Treating: Processes, subclasses 239+ for mechanical shaping or molding to form or reform a shaped article, especially subclasses 259+ for a composite article created by shaping or forming molding material against and uniting to a preform.

413, Sheet Metal Container Making, for a process or apparatus for performing an attendant operation before final assembly of a lid to a receptacle; subclass 34 for apparatus to seam together the receptacle and lid using a roller die and including means to apply a gasket or seal therebetween before they are.

425, Plastic Article Shaping or Earthenware Shaping or Treating: Apparatus, a generic class for apparatus not provided for elsewhere to mold a plastic, shape molten materials where no molding surface is employed, treating a product made by the apparatus of this class, randomly deposit and bond particulate material, or a combination of apparatus of this class with any diverse working or treating apparatus, Digest 47 for a seal ring.

451, Abrading, subclasses 28+ for a process of performing an abrading operation (i.e., where the sharp edges of mineral crystals form the cutting instrument) and a process of performing an ancillary operation not provided for elsewhere.

**925 SNAP FIT FEATURE FOR MOUNTING OR ASSEMBLY OF SEAL:**

This subclass is indented under the class definition. Sealing means comprising a seal having a projecting or receiving portion secured by a sudden sharp engagement means for installation or construction.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

376, for a unitized, relatively rotatable, radially extending, sealing face member mounted by snap fitting into a groove in a housing or casing.

**926 SEAL INCLUDING FLUID PRESSURE EQUALIZING OR BALANCING FEATURE:**

This subclass is indented under the class definition. Sealing means including means to create a fluid pressure equilibrium at the joint or juncture.

(1) Note. This subclass collects patents for this concept not covered by a regular subclass.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

304, for a process of dynamic, close proximity seal (e.g., contactless, fluent, etc.) created by pressurized sealing fluid introduced to form a barrier.

431+, for a dynamic, close proximity seal (e.g., contactless, fluent, etc.) created by pressurized sealing fluid introduced to form a barrier.

544, for a dynamic segmented ring circumferentially contacting seal for other than a piston having pressure balancing or radial bias reducing means.

## SEE OR SEARCH CLASS:

384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclass 479 for a radial antifriction bearing where the seal establishes a pressure or pressure responsive means loads the seal.

**927 SEAL INCLUDING FLUID PRESSURE DIFFERENTIAL FEATURE:**

This subclass is indented under the class definition. Sealing means including means to create a fluid pressure greater than or less than the pressure of the sealed fluid at the joint or juncture to oppose the flow of fluid.



SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 304, for a process of dynamic close proximity seal (e.g., contactless, fluent, etc.) created by pressurized sealing fluid introduced to form a barrier.
- 431+, for a dynamic close proximity seal (e.g., contactless, fluent, etc.) created by pressurized sealing fluid introduced to form a barrier.
- 512+, for a dynamic circumferential contact seal for other than a piston intended to be contained or compressed by a gland member in a packing box having means to introduce or direct a fluid.

SEE OR SEARCH CLASS:

- 384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclass 479 for a radial antifriction bearing where the seal establishes a pressure or pressure responsive means loads the seal.

## 928 SEAL INCLUDING PRESSURE RELIEF OR VENT FEATURE:

This subclass is indented under the class definition. Sealing means including means for releasing or relieving fluid pressure at the joint or juncture.

- (1) Note. For this subclass a valve for a passageway must claim or disclose a venting function.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 408, for a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.) including means to introduce, circulate, or remove fluid.
- 457, for a piston groove having a passageway for fluid return, pressure relief, or venting.
- 514, for a dynamic, circumferential contact seal for other than a piston intended to be contained or compressed by a gland member in a packing box having fluid draining, venting or pressure relief means.

- 552, for a dynamic, circumferential contacting, peripheral, radially sealing, flexible projection (e.g., lip seal, etc.) including a pressure relief or venting means for other than a piston.

SEE OR SEARCH CLASS:

- 384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclass 479 for a radial antifriction bearing where the seal establishes a pressure or pressure responsive means loads the seal.

## 929 SEAL FEATURE WHERE CHANGE IN OPERATION OR CONDITION INDUCES ADDITIONAL LEAKAGE CONTROL:

This subclass is indented under the class definition. Sealing means including means to prevent seepage from occurring at the joint or juncture during a change in the system or state of the seal (e.g., when relative movement between parts stops, etc.).

- (1) Note. This subclass collects patents for this concept not covered by a regular subclass.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 425+, for a dynamic, close proximity impeller (e.g., slinger, etc.) seal having a static sealing means affected by rotational movement.
- 433, for a dynamic contact seal where centrifugal force affects displacement, shape, or contact of seal.
- 558, for a dynamic, circumferentially peripheral, radially sealing, flexible projection including a fluid pressure responsive biasing feature contact for other than a piston.
- 914, for a seal having a backup seal in case of failure of primary seal.

SEE OR SEARCH CLASS:

- 384, Bearings, for more than nominal bearing structure or detail (e.g., liner, bearing race, cage, etc.) combined with a specific seal, subclass 131 for a plain radial bearing where fluid moves the seal, subclasses 135+ for a plain radial bearing where centrifugal force

moves or holds the seal in place, subclass 478 for a radial antifriction bearing where centrifugal force loads the seal or a liquid or gas forms a sealing barrier, or subclass 479 for a radial antifriction bearing where the seal establishes a pressure or pressure responsive means loads the seal,.

**930 SEAL INCLUDING HEATING OR COOLING FEATURE:**

This subclass is indented under the class definition. Sealing means including means to transfer thermal energy (e.g., heater, heat exchanger, or heat transmitter; hot or cold fluid, etc.).

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 408, for a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.) including means to introduce, circulate, or remove fluid.
- 432, for a dynamic, close proximity seal created by pressurized sealing fluid introduced to form a barrier including an external device or system.
- 513, for a dynamic, circumferential contact seal for other than a piston intended to be contained or compressed by a gland member in a packing box having means to introduce or direct a fluid having an external device or system.
- 597, for a static, contact seal for use between parts of an internal combustion engine having a heat dissipating, cooling, or insulating feature.

SEE OR SEARCH CLASS:

- 165, Heat Exchange, subclasses 47+ for a heat exchanger including structural installation on apparatus external to the subject matter of this class.
- 184, Lubrication, for a unitized lubrication means removable or installable from one machine to on another and intended to lubricate a bearing part in a machine, subclasses 104.1+ for a lubricator including a heating or cooling device.

**931 SEAL INCLUDING TEMPERATURE RESPONSIVE FEATURE:**

This subclass is indented under the class definition. Sealing means including means to react to a change in a measure of warmth or coldness.

- (1) Note. This and indented subclasses do not include a seal that merely accommodates thermal expansion between parts.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 359+, for a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.) having a temperature responsive feature.
- 471, for a particular piston ring expander having thermal expansion means.

SEE OR SEARCH CLASS:

- 285, Pipe Joints or Couplings, for means to secure in end-to-end or side-to-side relationship a pipe to another pipe, a plate, a wall, a receptacle, or other base where the means are independent from a seal (i.e., more than the frictional engagement of the seal secures a pipe end to another part) or a sleeve securing the pipe ends or another part; subclass 187 for temperature responsive means to maintain a good seal for expansion or contraction in the pipe coupling.

**932 Bi-metallic:**

This subclass is indented under subclass 931. Temperature responsive sealing means consisting of two metals having different coefficients of thermal expansion.

SEE OR SEARCH CLASS:

- 428, Stock Materials or Miscellaneous Articles, a residual class for a structurally defined stock material, non-structural laminate, article of manufacture, or intermediate article of manufacture not provided for elsewhere; subclasses 616+ comprising different contiguous layers or portions, each having a matrix or continuous phase of free metal having the property of bending or lengthening in

a circular fashion in response to an increase in temperature.

**933 Chemical reaction or physical change of state:**

This subclass is indented under subclass 931. Temperature responsive sealing means wherein the sealing means changes its molecular structure or changes its phase (e.g., by polymerizing, volatilizing, intumescenting, fusing, melting, freezing, etc.) from one condition (i.e., a solid, liquid, or gas) to another.

**SEE OR SEARCH CLASS:**

252, Compositions; subclass 72 for a composition that contains an agent for stopping or reducing a leak in a container; or subclass 378 for a process of intumescenting vermiculite, other micaeous substances or other materials, or a product of such a process not provided for elsewhere.

523, Synthetic Resins or Natural Rubbers, subclass 179 for a process of preparing a desired or intentional composition of at least one solid polymer or specified intermediate condensation product, or product thereof having utility as an ablative or an intumescent coating composition is claimed or solely disclosed, or to processes or preparation thereof.

**934 SEAL SWELLS WHEN WET:**

This subclass is indented under the class definition. Sealing means including means to absorb liquid to increase the volume of the sealing means.

**935 SEAL MADE OF A PARTICULAR MATERIAL:**

This subclass is indented under the class definition. Sealing means consisting of a specific composition or substance.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

404+, for a relatively rotatable, radially extending, sealing face member (e.g., face, mechanical, etc.) made of a particular material.

428, Stock Material or Miscellaneous Articles, a residual class for a structurally defined stock material, nonstructural

laminate, an article of manufacture, not provided for elsewhere; subclasses 131+ for a structurally defined web or sheet (e.g., an overall dimension, etc.) including an aperture.

440+, for a piston ring having a surface of dissimilar material or hardness.

534+, for a dynamic, circumferential, contact seal for other than a piston intended to be contained or compressed by a gland member in a packing box having a particular material or construction.

627, for a static, contact seal intended for use on a pipe, conduit, or cable having a particular material or construction.

650+, for a static, contact seal for other than an internal combustion engine, or a pipe, conduit, or cable having a particular sealing material or construction.

934, for a seal that swells when wet.

**936 Composite:**

This subclass is indented under subclass 935. Made of a particular material consisting of specific distinct substances that retain their identities in the material used to form the sealing means.

**SEE OR SEARCH CLASS:**

428, Stock Materials or Miscellaneous Articles, a residual class for a structurally defined stock material, nonstructural laminate, article of manufacture or intermediate article of manufacture, not provided for elsewhere; subclasses 320.2+ comprising a single or plural web or sheet that contains components where at least one contains a liquid or has a constituent trapped inside preformed walls; subclasses 357+ containing or consisting of a strand, fiber, grain, cell, particle or any substance in terms of a particular size or shape, a plurality or such arranged relative to one another, a particular interengagement of a plurality of such or a coating associated therewith; subclasses 411.1+ for a composition of layers adhered or cohered to each other; subclass 426 for layers adhered or cohered to each other where a layer contains glass that may be in fiber or mat form; or sub-

classes 615+ comprising different contiguous layers or portions, each having a matrix or continuous phase of free metal.

**937 Glass particles or filament:**

This subclass is indented under subclass 936. A composite wherein the composite material includes pieces or fibers of glass to reinforce the seal structure.

**SEE OR SEARCH CLASS:**

428, Stock Materials or Miscellaneous Articles, a residual class for a structurally defined stock material, non-structural laminate, article of manufacture or intermediate article of manufacture, not provided for elsewhere; subclass 406 containing or consisting of particulate matter comprised of glass having a particular size or shape and a coating or subclass 426 for layers adhered or cohered to each other where a layer contains glass that may be in fiber or mat form.

**938 Carbon or graphite particle or filament:**

This subclass is indented under subclass 936. A composite wherein the composite includes a piece or fiber of carbon to reinforce the seal structure.

**SEE OR SEARCH CLASS:**

428, Stock Materials or Miscellaneous Articles, a residual class for a structurally defined stock material, non-structural laminate, article of manufacture or intermediate article of manufacture, not provided for elsewhere; subclasses 367+ containing carbon as an element or compound, and consisting of or coating a rod, strand, filament or fiber.

**939 Containing metal:**

This subclass is indented under subclass 935. Made of a particular material wherein the composition or substance contains metal.

**SEE OR SEARCH CLASS:**

420, Alloys or Metallic Compositions, for a generic class for alloys containing metal or metallic compositions that contain a continuous phase of metal,

methods of making it not provided for elsewhere, or “elemental” metal, per se.

428, Stock Materials or Miscellaneous Articles, a residual class for a structurally defined stock material, non-structural laminate, article of manufacture or intermediate article of manufacture, not provided for elsewhere; subclasses 544+ for metallic.

**940 Alloy:**

This subclass is indented under subclass 939. Containing metal wherein the composition or substance is an intimate mixture of metals or of a metal and a nonmetal.

**941 Aluminum or copper:**

This subclass is indented under subclass 939. Containing metal wherein the composition or substance contains copper or aluminum.

**942 Silver or gold:**

This subclass is indented under subclass 939. Containing metal wherein the composition or substance contains silver or gold.

**943 Ceramic or glass:**

This subclass is indented under subclass 935. Made of a particular material wherein the composition or substance is a fired clay containing composition (e.g., porcelain, earthenware, etc.), glass or refractory composition (e.g., inorganic oxides, carbides, etc.).

**SEE OR SEARCH CLASS:**

501, Compositions: Ceramic, subclasses 1+ for inorganic compositions other than Portland cement or cementitious material prepared from gypsum that are heat treated by firing, calcining, sintering, or fusion of a part of the inorganic material during manufacturing or subsequent use to effect hardening or fusion followed by hardening when cooled and processes not provided for elsewhere, and especially subclasses 11+ for a glass composition or a composition intended to be heat treated to form a glass.

**944 Elastomer or plastic:**

This subclass is indented under subclass 935. Made of a particular material wherein the composition or substance is rubberlike.

SEE OR SEARCH THIS CLASS, SUBCLASS:

582, for a dynamic, circumferential contact floating ring or bushing made of a particular elastomeric material for other than a piston.

SEE OR SEARCH CLASS:

520, Synthetic Resins or Natural Rubbers, subclasses 1+ is the generic subclass for a synthetic resin or natural rubber preparation, and composition containing or treatment thereof is to be considered an integral part of Class 260 retaining all pertinent definitions and class lines and having Classes 521, 522, 523, 524, 525, 526, 527, and 528 indented thereunder.

**945 Containing fluorine:**

This subclass is indented under subclass 944. Consisting of elastomer or plastic wherein the elastomer or plastic includes fluoride.

SEE OR SEARCH THIS CLASS, SUBCLASS:

570, for a dynamic circumferential contacting peripheral radially sealing flexible projection made of fluorocarbon for other than a piston.

**946 PTFE OR TEFLON:**

This subclass is indented under subclass 945. Containing fluorine wherein the fluoride is part of a polytetrafluoroethylene composition.

### FOREIGN ART COLLECTIONS

The definitions for FOR 100-FOR 250 below correspond to the definitions of the abolished subclasses under Class 277 from which these collections were formed. See the Foreign Art Collection schedule for specific correspondences. [Note: The titles and definitions for indented art collections include all the details of the one(s) that are hierarchically superior.]

**FOR 100**

Foreign art collections comprising a chamber and a member coaxial therewith a packing within said chamber and a follower exerting an axial thrust on the packing and biasing it radially into sealing engagement with the chamber and coaxial member.

**FOR 101**

Foreign art collections wherein the follower is a fluid piston.

**FOR 102**

Foreign art collections wherein the follower comprises a plurality of connected segments.

**FOR 103**

Foreign art collections wherein the follower is provided with a flange which is adjustably secured to the chamber by bolts or studs.

**FOR 104**

Foreign art collections comprising spring means external of the chamber acting directly on the flange or bolt.

**FOR 105**

Foreign art collections comprising an operating handle for actuating the follower.

**FOR 106**

Foreign art collections wherein the follower comprises a part which is modified for engagement with a tool.

**FOR 107**

Foreign art collections wherein the follower is actuated by a weight.

**FOR 108**

Foreign art collections wherein the follower comprises an internally screw-threaded thimble.

**FOR 109**

Foreign art collections provided with a locking means to prevent undesired looseness or retrograde movement of the screw thimble.

**FOR 110**

Foreign art collections in which the follower is screw-threaded into the chamber.

**FOR 111**

Foreign art collections comprising a mechanism for transmitting motion between an actuator and a follower.

**FOR 112**

Foreign art collections wherein the follower is provided with means preventing retrograde movement thereof.

**FOR 113**

Foreign art collections wherein the chamber is a packing box, the box or follower being tapered on the surface contacting the packing.

**FOR 114**

Foreign art collections wherein the tapered surface is arcuate.

**FOR 115**

Foreign art collections comprising an axially related backing member for the packing having portions which are biased radially due to an axial movement of the follower, said member being structurally dissimilar to the packing.

**FOR 116**

Foreign art collections wherein the packing is retained on a central stem comprising a plurality of telescoping members each having a radial shoulder the packing being held between respective shoulders and biased by relative movement thereof.

**FOR 117**

Foreign art collections comprising a radially related sleeve disposed between the packing and a central member on which the packing is held, the sleeve being so configured that axial movement thereof will cause the packing to be biased radially outwardly into packing engagement.

**FOR 118**

Foreign art collections wherein at least a part of a packing member is spaced from the central stem and is so arranged that the action of the follower is to bend or bow the packing member about one or more distinct points.

**FOR 119**

Foreign art collections wherein the bias is transmitted through wedging surfaces.

**FOR 120**

Foreign art collections wherein a wedging surface is on a shell within the chamber.

**FOR 121**

Foreign art collections wherein a wedging surface is disposed on a split or segmental packing member.

**FOR 122**

Foreign art collections wherein one packing member or segment expands and another packing member or segment contracts due to the action of the follower.

**FOR 123**

Foreign art collections comprising at least one packing member or segment made of elastomeric material.

**FOR 124**

Foreign art collections wherein one of the packing members or segments is adapted to contract due to the action of the follower.

**FOR 125**

Foreign art collections comprising a plurality of packing elements.

**FOR 126**

Foreign art collections wherein at least a portion of one packing member is disposed within a portion of another packing member.

**FOR 127**

Foreign art collections wherein the packing members are dissimilar.

**FOR 128**

Foreign art collections comprising adjustable means operable exteriorly of a packing chamber or seat for biasing the packing into sealing engagement.

**FOR 129**

Foreign art collections wherein the means comprises a fluid motor.

**FOR 130**

Foreign art collections wherein the means comprises a circumferential band contacting a peripheral surface of the packing.

**FOR 131**

Foreign art collections wherein the means acts along a radial line extending through the packing.

**FOR 132**

Foreign art collections comprising a packing box having an access opening in a side wall thereof.

**FOR 133**

Foreign art collections comprising a distinct closure for the access opening.

**FOR 134**

Foreign art collections wherein the closure member is connected to or integral with a packing member.

**FOR 135**

Foreign art collections comprising an impeller or baffle means, at least a part of which is rotatable, which means acts to deflect the path of dust or fluid to prevent passage of same through the juncture.

**FOR 136**

Foreign art collections wherein the impeller or baffle means is so constructed as to direct fluid in a direction parallel to the axis thereof.

**FOR 137**

Foreign art collections wherein the packing comprises a liquid barrier sustained between the sealed members.

**FOR 138**

Foreign art collections wherein a packing or bias member is keyed or anchored to its seat so as to prevent relative rotation.

**FOR 139**

Foreign art collections wherein the key or anchor engages a radial wall of the packing seat.

**FOR 140**

Foreign art collections comprising means distinct from the inherent resilience of the

packing material for biasing the packing in a radial direction.

**FOR 141**

Foreign art collections wherein the bias means is a spacer or holder for axially spaced packing members.

**FOR 142**

Foreign art collections wherein the spacing means is of generally U-shaped cross section.

**FOR 143**

Foreign art collections wherein two or more axially spaced packing rings have a single common bias means.

**FOR 144**

Foreign art collections comprising additional bias means acting in an axial direction.

**FOR 145**

Foreign art collections comprising means for resolving a radial force into axial and radial biasing components.

**FOR 146**

Foreign art collections wherein the radial bias acts through inclined surfaces.

**FOR 147**

Foreign art collections wherein the elements which comprise the inclined surfaces are symmetrical to a plane transverse of the axis of the packing.

**FOR 148**

Foreign art collections comprising means associated with the bias means which (1) prevents the bias means from escaping from a seat or (2) limits the action of the bias means.

**FOR 149**

Foreign art collections comprising means for adjusting the stress on the bias means.

**FOR 150**

Foreign art collections wherein the packing comprises a plurality of segments at least one of which is biased independently of the remaining segment(s).

**FOR 151**

Foreign art collections comprising a plurality of springs which act in a radial direction at spaced points about the periphery of the packing.

**FOR 152**

Foreign art collections wherein the bias means is disposed within a radial socket or about a radial pin.

**FOR 153**

Foreign art collections wherein the biasing means exerts a thrust at spaced points on the circumference of the packing and in a direction tangential or parallel thereto.

**FOR 154**

Foreign art collections wherein the bias means acts directly on a lip or boss extending axially of the seat engaging part of the packing.

**FOR 155**

Foreign art collections wherein the bias means is a coil spring exposed throughout at least a portion of its periphery.

**FOR 156**

Foreign art collections wherein the packing comprises a plurality of segments, the opposed end portions of which are provided with complementary interfitting portions.

**FOR 157**

Foreign art collections wherein the packing comprises a plurality of segments, the opposing ends of which are capped or bridged by a separate segment.

**FOR 158**

Foreign art collections comprising plural split or segmental packing members with the joint or gap between opposed ends of each packing member, so arranged as to be out of registration with the corresponding portion of an adjacent packing member.

**FOR 159**

Foreign art collections comprising a spring which engages the periphery of the packing member.

**FOR 160**

Foreign art collections wherein the spring and packing are of diverse peripheral shape.

**FOR 161**

Foreign art collections wherein the spring has tongues or projections extending from the main body thereof.

**FOR 162**

Foreign art collections wherein the spring is wave or undulate in shape.

**FOR 163**

Foreign art collections wherein the spring is of polygonal shape.

**FOR 164**

Foreign art collections wherein the spring has a gap between two spaced ends.

**FOR 165**

Foreign art collections wherein the spring is of spiral configuration.

**FOR 166**

Foreign art collections comprising a spring embedded within or enclosed by a packing element.

**FOR 167**

Foreign art collections wherein the means for biasing the packing is made of a nonmetallic material.

**FOR 168**

Foreign art collections comprising anchor means extending through or interfitting with the packing.

**FOR 169**

Foreign art collections comprising a helical packing seat.

**FOR 170**

Foreign art collections comprising a pair of complementary packing members, each seated or anchored to a respective member to be packed, in sealing engagement therewith, and also being in sealing engagement with the other packing member, both of said packing members being necessary to perform a sealing function.



**FOR 171**

Foreign art collections comprising a recess in each of two packed members, the two recesses cooperating to form a single packing seat.

**FOR 172**

Foreign art collections comprising a seat for a packing element, said seat having a portion which is stepped or tapered in the direction of its width.

**FOR 173**

Foreign art collections comprising an arcuate wall portion.

**FOR 174**

Foreign art collections comprising an oblique wall portion.

**FOR 175**

Foreign art collections comprising a plurality of oblique wall portions.

**FOR 176**

Foreign art collections wherein the oblique portions are parallel to each other.

**FOR 177**

Foreign art collections comprising a packing member which is relatively movable with respect to both members.

**FOR 178**

Foreign art collections wherein the packing member is movable as a unit in a radial direction.

**FOR 179**

Foreign art collections wherein the packing member is held against a cooperating surface by an axially acting spring.

**FOR 180**

Foreign art collections comprising an additional member which cooperates with the packing member.

**FOR 181**

Foreign art collections wherein the packing member is composed of elastomeric material.

**FOR 182**

Foreign art collections wherein a part of a packing member interfits with a flange which projects radially from a member to which the packing is attached.

**FOR 183**

Foreign art collections wherein a reinforcement is embedded in a packing element opposite a tapered mounting surface.

**FOR 184**

Foreign art collections comprising a compressible packing and a rigid element associated therewith, said rigid element serving to limit the compression, said rigid material being of harder material than the remaining portion of said packing.

**FOR 185**

Foreign art collections comprising a packing member having a distinct retaining portion carried thereby to retain said packing member in its operative position.

**FOR 186**

Foreign art collections wherein the attaching member comprises a confining or housing element engaging the packing member about its outer periphery.

**FOR 187**

Foreign art collections wherein the housing element is provided with a radial flange defining a mounting portion for the housing element.

**FOR 188**

Foreign art collections comprising a radially opening channel-shaped member.

**FOR 189**

Foreign art collections wherein there are two packing attached retainers, one at each of two axially opposed ends of the packing.

**FOR 190**

Foreign art collections wherein the retaining portion is resilient.

**FOR 191**

Foreign art collections comprising a packing chamber or seat having a detachably secured end wall.

**FOR 192**

Foreign art collections comprising a backing or retaining member axially related to a packing element. Mere duplication of the same packing element in a single seat or chamber is classified on the basis of a single element in the same environment.

**FOR 194**

Foreign art collections comprising a means for anchoring or retaining a packing member in operative position.

**FOR 195**

Foreign art collections wherein the packing seat comprises a plurality of intimately secured parts.

**FOR 196**

Foreign art collections comprising a plurality of complementary portions, at least one of which is of wedge-shaped cross-section, the displacement of said wedge-shaped portion relative to the other, causing a corresponding lateral deflection or displacement due to the wedging action.

**FOR 197**

Foreign art collections comprising a covering completely enclosing the complementary portions.

**FOR 198**

Foreign art collections comprising a plurality of separable distinct segments which are interrelated to form a single packing element.

**FOR 199**

Foreign art collections wherein the segments are axially related to each other.

**FOR 200**

Foreign art collections wherein at least one of the segments is of L-shaped cross-section.

**FOR 201**

Foreign art collections comprising an additional segment which is related radially with respect to at least one of the other segments.

**FOR 202**

Foreign art collections wherein at least one of the segments is coiled or corrugated.

**FOR 203**

Foreign art collections comprising split segments oriented so that the splits of adjacent segments are in diametrically opposed relation.

**FOR 204**

Foreign art collections wherein the segments are nested in concentric relationship.

**FOR 205**

Foreign art collections wherein the ends of the segments are provided with complementary interfitting parts.

**FOR 206**

Foreign art collections comprising a packing member having a pair of axially spaced flanges joined by an intervening web of corrugated or undulated formation.

**FOR 207**

Foreign art collections comprising an annular packing element having an opening which extends through a wall thereof.

**FOR 208**

Foreign art collections wherein the opening is elongated.

**FOR 209**

Foreign art collections comprising a packing element which is coiled into a helical configuration.

**FOR 210**

Foreign art collections comprising a packing element coiled about itself in a volute formation.

**FOR 211**

Foreign art collections comprising a packing member having a pair of flexible peripheral lips extending from a body portion, said lips and body portion together forming a channel-shaped cross-section, the lips being of greater extent than any intervening part.

**FOR 212**

Foreign art collections wherein the channel opens radially and each side wall of the channel has a component in a radial direction.

**FOR 214**

Foreign art collections comprising a packing element having a plurality of ribs extending therefrom adapted for contact with another member forming a sealing surface therewith.

**FOR 215**

Foreign art collections wherein the ribs are axially spaced on the circumference of the packing element.

**FOR 216**

Foreign art collections wherein the ribs are on opposite sides of the packing element.

**FOR 217**

Foreign art collections wherein the ribs make substantially a line contact with the member against which they bear.

**FOR 218**

Foreign art collections wherein the ribs are on opposite sides of the packing element.

**FOR 220**

Foreign art collections comprising a packing element having a flexible lip extending axially from either the inner (flange type) or the outer (cup type) periphery of a body portion.

**FOR 224**

Foreign art collections comprising a packing element having a contact surface provided with a plurality of folds or corrugations.

**FOR 225**

Foreign art collections comprising a packing element having a groove in a surface extending about the entire circumference thereof.

**FOR 226**

Foreign art collections comprising a packing element provided with a plurality of spaced pockets, grooves or recesses in a peripheral surface.

**FOR 227**

Foreign art collections comprising an annular packing element provided with a radial split forming two opposed ends.

**FOR 228**

Foreign art collections wherein the radius of the packing element varies from point to point when said element is in a relaxed state.

**FOR 229**

Foreign art collections comprising means separate from the annulus for closing the gap between the two opposed ends or to connect the ends together.

**FOR 230**

Foreign art collections wherein the gap or bridging piece is fixedly secured to at least one end of the annulus.

**FOR 231**

Foreign art collections comprising means for joining the opposed ends of the packing element.

**FOR 232**

Foreign art collections comprising a tongue extending outwardly from one end and a complementary slot in the opposing end for receiving said tongue.

**FOR 233**

Foreign art collections wherein the end portions are provided with complementary bevelled or arcuate mating surfaces.

**FOR 234**

Foreign art collections comprising two parts, one of which fits within a recess in the other.

**FOR 235**

Foreign art collections wherein the insert is made of a material which is harder than that of the remainder of the packing element.

**FOR 236**

Foreign art collections comprising a packing element having a radial peripheral flange intermediate its ends.

**FOR 237**

Foreign art collections comprising a tubular sheath which confines a core of fluent material or a vacuum.

**FOR 238**

Foreign art collections comprising two or more parts of similar or dissimilar material.

**FOR 239**

Foreign art collections wherein one of the parts is an elastomeric core which is completely enclosed by another part.

**FOR 240**

Foreign art collections wherein one of the parts comprises a sheath which completely encircles a core about at least one axis, said sheath being identifiable apart from the core.

**FOR 241**

Foreign art collections wherein the sheath comprises a plurality of strands which are woven or braided together.

**FOR 242**

Foreign art collections wherein one of the parts is of U-shaped or V-shaped configuration and forms an exterior contact surface which overlaps or confines a portion of the other part.

**FOR 243**

Foreign art collections wherein the overlapped or confined portion comprises two or more distinct plies.

**FOR 244**

Foreign art collections comprising two or more planar or conical plies.

**FOR 245**

Foreign art collections wherein an outer ply is made of metal.

**FOR 246**

Foreign art collections wherein one of the parts comprises metal.

**FOR 249**

Foreign art collections made of metal.

**FOR 250**

Foreign art collections not provided for in the above subclasses.

END